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EXPERIMENT STATION RECORD.

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For the first time in history the United States, along with several others of the allied countries, has drawn up a working program for agriculture, to secure adequate production. This is one of the many unusual features growing out of war conditions, and particularly of our relations and responsibilities to the allied countries. The new memorandum, issued by the Department of Agriculture in February, supplements the one published in August of last year relating mainly to cereals.

Like most of the measures in this country pertaining to food production, this is not a prescribed program but comes in the form of a carefully weighed suggestion as to the needs and the means of meeting them. It is voluntary, of course, but it is hoped that it may serve to give general direction to the season's campaign and stimulate efforts in the lines in which they are most desirable. Its appeal rests primarily on the necessity of the situation, and the understanding of agriculture's part in the great war.

In a word, the outline is "a statement of conclusions concerning the agricultural situation and the planting needs. . . . It is offered as a recommendation for those engaged in crop and animal production, especially for the many farmers who are in a position to readjust their agricultural program in accordance with the national necessities." In the main it is general rather than specific, except for wheat, and it is considerate of farming conditions and specialized branches. It is in no sense an office program made up on statistical and theoretical considerations, but it embodies the judgment and suggestion of agricultural leaders throughout the country. The needs and the possibilities have been viewed in the light of the conditions which prevail at this time. It is designed therefore as both practical and practicable, barring untoward developments of the season. It is therefore something to work to, and to join hands in seeking to attain.

While the situation is such that chief emphasis is laid on the production of the great staple food products, with special stress on

wheat and hogs, the outline summarizes the aims for securing sufficient cereals of various kinds, meat and dairy products, sugar, cotton, and other products for the Nation, its armies, and its Allies. It will furnish the basis for personal appeal and guidance throughout the country, but it differs radically from the programs of some of the European countries in its lack of provision for enforcement or regulation of the industry, such as is now common there. For agriculture in the war has assumed the character of a military necessity in those countries, and although not brought directly under military control, it is dominated to a large degree by its requirements and subjected to civil orders and regulations hardly less mandatory.

The increasing extent to which these measures have been put into effect in Europe, especially in the past year, shows by comparison the relative freedom which prevails here, and the absence of many of the real handicaps and hardships which have to be met in other countries. Here dependence is placed on individual response and the determination to resist failure, while there regulation and compulsion have been resorted to in a thousand ways new to modern times, and stimulation and direct aid have become the order of the day. A knowledge of the conditions and measures relating to agriculture in the war is of no small interest in this country, since food production has become one of the great cooperative enterprises between us and our Allies.

The efforts made in respect to European agriculture are well illustrated in Great Britain, since that country has been peculiarly dependent on outside food supplies. This has amounted in the past to four-fifths of its consumption of wheat and two-thirds of its food-stuffs as a whole. It has resulted in increasing the cost of the war, complicated the problem of foreign exchange, and made heavy demands on the tonnage of the merchant marine when its services were greatly needed otherwise.

This dependence on outside supplies was due in part to the amount of land in permanent grass, which under prevailing conditions was steadily increasing. As Mr. A. D. Hall has pointed out, during the forty years from 1872 to 1913 three and one-half million acres in England and Wales passed from cultivation into grass land, and the number of men employed in agriculture steadily declined with the area of plowed land.

Ordinarily the farmers of England and Wales plow about eight million acres a year. The area of temporary and permanent grass in the country amounts to 18,500,000 acres. Dr. E. J. Russell, director of the Rothamsted Station, has given some interesting illustrations of what this means to food production. For example, land in potatoes produces nearly forty times as much food as medium grass

land, while wheat land produces about eighteen times as much. An acre of these crops yield fifteen hundredweight of flour or six tons of potatoes, as compared with one hundredweight of meat from an acre of grass. The Board of Agriculture has shown that the grass lands of the country were feeding about twenty persons per hundred acres, whereas the same area of cultivated land feeds about eighty-four persons. Moreover, as the president of the board has pointed out, special emphasis was laid in the nineteenth century on the production of quality, while the present situation emphasizes quantity. "This grave situation therefore insists that we should recast the rules of good husbandry as understood by ourselves and practiced by our forefathers."

In the early stages of the war the main reliance was placed on appeals to voluntary action and the organization of machinery for stimulating greater production of staple foods. A proposal in 1915 to provide a guaranty for wheat as a means of inspiring the confidence of farmers was rejected by the government. Such a fixing of prices came later, and the past year especially has witnessed a great change in the attitude toward agriculture. It has come nearer to developing the foundation of an agricultural policy than anything that has gone before, and has shown the possibility of quickly effecting changes of most sweeping character.

Naturally, this has entailed a great many disturbances of long established customs and systems in agriculture and resulted in interference in individual action to a degree heretofore unheard of. The long list of orders, regulations, and prohibitions would have been regarded as very highbanded and autocratic a short time ago, and on the other hand things are now being done for the farmer which had not been dreamed of before. For the British farmer has not been accustomed to the various forms of governmental aid and assistance so prevalent in this country.

At the outset of the war the farmer's labor and his horses, as well as certain of his products, were largely claimed by the army. This placed him under great disadvantage in even maintaining his usual production. As early as 1915 the army requirement for hay approximated one-fourth of the entire annual production. Farmers were required to make returns as to the stocks on hand and to offer their supplies to avoid having them requisitioned. In 1916 and again in 1917, the Army Council took possession of all hay and of oat and wheat straw, to be held subject to its disposal.

Restrictions were placed by the food controller on the extent to which cereals might be used, including ultimately the prohibition of their use except for purposes of food and seed. License was required for buying or selling these products, and restrictions were

placed on the feeding of grains, especially wheat and barley, to live stock and poultry, if suitable for human consumption.

Potatoes were made the subject of numerous orders, growers being required to report monthly as to the estimated quantity in their possession, prices fixed, and a comprehensive scheme worked out for the distribution of seed potatoes. To safeguard the supply of the latter an order was issued forbidding their use for any other purpose and requiring certificates for transfer.

The cultivation of flax having become a military necessity, and the area in flax in Russia and Holland having been substantially reduced, with no dependence to be placed on getting seed from those countries, the Army Council issued an order requiring Irish farmers to save seed of the 1917 crop from at least one-eighth of an acre. Here the experiments of the Irish Department of Agriculture came into immediate use, and enabled the issuing of explicit instructions to farmers for securing the seed. Bounties were offered for flax cultivation which it is estimated will amount to upwards of a million pounds sterling. The government took possession of the 1917 crop for aeronautical supplies, and will take over the crop of 1918.

The government took possession of the hop crop of 1917, made the buying and selling of hops subject to permit by the food controller, and required growers to reduce the area of picking to one-half that of 1914 for the duration of the war.

In some sections of England bulb growers were required to take up one quarter of their area and substitute wheat, and also to plant wheat or oats between the rows on another twenty-five per cent of the land left in bulbs.

The British press has called attention to the difficulty of the farmers in feeding their live stock. Fodders and feed of all kinds have increased enormously in price, and sufficient supplies are hard to purchase. The government has taken possession of all oleagenous seeds, nuts, and kernels, including by-products like oil cakes, meal, and residues from such materials; the use of grains is very restricted, and there has been talk of priority orders giving milch cows the preference in the matter of feeds. Last year horse rationing orders were issued limiting the amounts and kinds of feed to be fed, especially to animals not used for agricultural purposes.

With the object of retaining an adequate supply of horses on the land the sale of horses used or capable of being used for cultivation of the land was forbidden except on a permit which takes account of their need on holdings. An order relative to the maintenance of live stock, issued in 1915, forbade the slaughter of animals in calf or in pig, and of calves under six months old except on license. The food controller has been empowered to requisition milk in localities where the supply is insufficient for local consumption and is being diverted;

and at the close of 1917 the use of cream was restricted to butter making and such other purposes as the food controller might authorize. All creameries, condenseries, and other milk factories were prohibited from acquiring or receiving any greater quantity of milk than was coming to them in 1916.

The entire wool clip of 1916 and 1917 was taken over by the government, prices fixed, and holders prohibited from selling to other purchasers.

The regulations have gone so far as to forbid the feeding of game products suited to human and live stock feeding, and to encourage the killing of certain game and migratory birds by extending the open season, the reduction of the stock of pheasants, and the destruction of rabbits, hares, rooks, sparrows, and rats.

An order relative to the drainage of lands, requiring ditches, drains, and outlets to be kept open, was later extended to give the Board of Agriculture power to regulate the flow of water in rivers and streams to prevent floods and provide for the draining of adjoining lands.

These are only a portion of the regulations prescribed, but they indicate something of their scope and wide variety. They are constantly being added to as necessity is found to require, and, as the agricultural press has pointed out, "practically every product of the farm is now controlled in some way or another by one or more of these many orders."

Unusual and far-reaching as some of these provisions are, they are not more radical than the steps taken for the encouragement and assistance of agriculture. Recently various measures have been adopted to relieve the farm labor situation, for while women had volunteered for farm work in large numbers and had proved a "powerful auxiliary," and town labor and children had been pressed into service, these can not be expected to fully replace men in farm work.

Arrangements were made for temporary release of farm laborers in the army, for delayed calling, and finally to practically stop recruiting from that class. Two years ago several thousand men were assigned to farm work and as many more from the home defense forces, and during the past year some fifty thousand men have been segregated from the army and the untrained ones given training for short periods at schools throughout England and Wales. The employment of prisoners of war has not been generally popular with English farmers, but they have been used by the government in large drainage and other enterprises.

At various times provision has been made for the temporary employment of army horses and mules with drivers, by farmers in the vicinity of the camps; and ultimately the Board of Agriculture arranged for the purchase through the army of some thirty thousand

horses for farmers' use, to be distributed through the county agricultural committees. A so-called "horse officer" is provided in each county to organize the scheme. The horses are hired out to the farmers at fixed rates, on the latter's agreement to increase the acreage of cereals. Traveling gangs of plowmen also do plowing, harrowing, cultivating, etc., for small farmers at fixed rates.

The tractor has sprung into prominence as a means of "speeding up" production, and has been supplied by the government in increasing numbers. Some six hundred tractors of various kinds were apportioned among the county agricultural committees in the spring of 1917, to help farmers prepare and cultivate their land, and proved so satisfactory that the Board of Agriculture purchased several thousand for the 1918 season. The operators are in part assigned from the army or have been exempted for this service, and women have been utilized for the purpose to a considerable extent. For some time the board has maintained schools for tractor operators, both male and female.

But the provision of farm machinery does not stop with the tractor. The government has procured a great number of farm implements and machines, ranging all the way from disks and drills, cultivators and harrows, to reapers and binders. These are rented out to farmers under proper supervision. The Board of Agriculture also arranged with the Threshing Machine Owners' Association to form gangs of women to work with their outfits.

Indeed, women are employed everywhere in farm work, and the Women's Land Army, recruited by the woman's branch of the Food Production Department, has become a very large and broadly recognized factor in production. The president of the Board of Agriculture has lately stated that "every able-bodied country woman is being pressed into the urgent service of food production,"—this in a country where in normal times women play practically no part in the national food production, as they do on the continent.

The difficulty of securing fertilizers and seeds has been greatly relieved by the government, which has established prices, put into effect unusually drastic laws for inspection, and furnished enormous quantities of both classes of supplies. Although England is the greatest seed broking center of the world, English merchants selling home-grown seed to foreign countries with a foreign certificate as to quality, there has hitherto been no official control of seeds in England and Wales. A seed-testing order was issued by the Board of Agriculture during the year, and an official seed-testing station was established under it.

Feed control has also been instituted during the past year, and recently a compound fertilizer order was issued by the Minister of Munitions, which provides for the first time for a guarantee of com-

position and unit values. No one may purchase potash except on license procured of the Ministry of Munitions.

The shortage of gasoline for a time threatened to seriously handicap the operating of farm machinery, but in the summer of 1917 arrangements were made to insure every consideration to farmers and others engaged in food production—even at a time when coal gas had largely taken the place of gasoline in the operation of motor buses and private cars, the supply of the gas being carried in large bags on top of the car or in a trailer.

Last year the Board of Agriculture arranged for a scheme of credit for farmers, which has lately been simplified in procedure and enlarged so as to apply to a great variety of supplies. Credit is extended by the local executive committees, through the applicant's banker, purchases of supplies being made by the farmer in the usual way and settled for by his bank, which submits the receipted invoice to the committee.

The fixing of prices of farm crops and supplies has covered an increasingly wide range of products. This was first undertaken as a means of stimulating production of certain crops, notably cereals and potatoes, by insuring minimum prices, but has been extended to other products to protect the farmer and the public, and as a part of the machinery of food control. In addition to the products mentioned, maximum prices have been fixed for most feeding stuffs, including feeding cakes, meals, and offals, representing an appreciable reduction over prevailing prices, and the Minister of Munitions last fall fixed maximum prices for fertilizers. Dairy products, including milk, butter, and cheese, have also been the subject of price regulation.

The government has also made arrangement for the manufacture of binder twine in England, to be sold to farmers at a fixed retail price for the season of 1918. It has determined upon and put into effect a minimum wage for farm labor, partly as a measure to hold people on the land. While this minimum wage of twenty-five shillings a week will seem low to us in this country, it illustrates the difference in standards, for it insures more favorable conditions than farm workers had enjoyed.

The most radical and fundamental measure affecting British agriculture is an order relative to the cultivation of land, issued early in 1917. This makes the Board of Agriculture responsible for the proper and effective use of the land for agricultural purposes, and confers upon it very broad and autocratic powers.

Under this order the board is authorized to take possession of any land not being so cultivated as to afford the largest practicable food

production and carry it on to that end, to require occupiers to change their plan of operations regardless of contracts, and to direct the breaking up of grass land for the growth of cultivated crops. It may also take over commons and waste lands, including sporting grounds, tennis courts, bowling greens, etc., and allot these lands to persons who will cultivate them. It practically gives the board control of agricultural land irrespective of its ownership, to be used in its discretion for the benefit of the Empire. Failure to comply with directions as to the cultivation or breaking up of land constitutes a serious offense against the Defense of the Realm Regulations.

The details of administration of the order are in the hands of the county executive committees, appointed by the war agricultural committees of the county councils, working under direction of the board. These committees have made surveys of both the cultivated and uncultivated land of their counties, issued directions for its proper utilization, and provided for inspection to insure compliance.

This measure is so extraordinary and far-reaching, and warrants such interference with established customs that it has naturally been the subject of considerable controversy and called for the exercise of unusual judgment and tact in its execution. In discussing the matter in a letter to the county committees, the president of the Board of Agriculture said: "Compulsion is no less distasteful to the Board of Agriculture than it is to farmers; yet it may in certain circumstances become a necessity. . . . In all cases the exercise of compulsory powers should always be the last resort, but in some it also remains the final resort."

In June the Prime Minister announced the official program for breaking up three million acres of grass land for the harvest of 1918. This was later reduced somewhat by taking account of the substitution of wheat for other crops. The final amount was prorated among the counties, and the executive committees were instructed to exercise discretion in selecting the poorer quality of grass land for breaking. The voluntary compliance of owners was urged, failing which notices were served which were mandatory.

Apparently there have been relatively few cases of refusal to comply with the new order, but where there have been convictions have followed. No indemnity has been provided farmers against loss from change in their system except the assurance of minimum prices. The reasonableness of the measure seems to have been generally accepted. One of the leading farm journals predicts that the right to interfere in cases of bad farming will hardly be restricted to a war measure, "but will certainly be used with considerable effect after the war is over."

As a result of the new order, together with the various regulatory and stimulative measures, the president of the Board of Agriculture

reported that of all the belligerent nations (except the United States), the United Kingdom alone in the third year of the war produced more grain than in 1916, in spite of the overwhelming difficulties under which the farmers labored. It was also announced as certain at the close of last year that a greater area of wheat had been sown in England than in any season during the past twenty years.

Still greater efforts are being made for the current year, for "we can no longer expect to obtain from abroad the quantities of bread and meat by which we have been accustomed to sustain life at home. If we do not feed ourselves no other country can or will. To what extent we shall be short of food depends on the extent of our success or failure in increasing our home-grown supplies." Evidently determination is nowhere more pronounced than in relation to agriculture. Its prosecution has become a war measure of highest importance, and the country is straining every nerve and resource to meet the necessity as now clearly seen.

These high purposes and splendid efforts command admiration. The determination to rise above the handicaps and difficulties which surround the industry furnishes an evidence of what may be accomplished under cooperation and effective leadership. Time-honored customs and long-established systems have been swept aside, in a country proverbially conservative and among a class slow to make radical change.

The British farmer has had to meet harsh criticism and charges from sources unreasoning and uninformed as to the real situation and its difficulties. These have been an added burden, but the British Premier, himself born on the land, has urged the farmer to think only of one thing—his country's need, and has confidently predicted that this will enable him to win a great triumph for British agriculture and for the Empire.

Such an example ought to prove an inspiration to us in this country, where the aims are similar and the obstacles less pronounced. We have reached the stage for adjustment in many matters and the necessity for a larger measure of cooperation in realizing the desired result. The employment of every resource is necessary. To help in this accomplishment is the opportunity of the colleges, the stations, and the vast army of agricultural extension throughout the land.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The origin and distribution of urea in nature.—Application of new methods for the determination of urea based on the use of xanthydrol, R. FOSSE (*Ann. Inst. Pasteur*, 30 (1916), Nos. 10, pp. 525-592, figs. 13; 11, pp. 642-676, fig. 1; 12, pp. 739-755).—The material reported is divided into a brief introduction and five parts, as follows:

I. *The qualitative and quantitative gravimetric analysis of urea by means of xanthydrol* (pp. 531-592).—The reactions and the procedures are described and discussed in detail.

II. *Proteins and urea* (pp. 642-660).—Experimental data on the production of urea by the action of potassium permanganate and alkalis on various proteins are submitted and the theory of the reactions discussed.

III. *Synthesis of urea by oxidation of ammonia and carbohydrates or glycerin*.—The probable participation of carbohydrates and fats in the phenomenon of ureogenesis (pp. 660-672).—Data submitted show that urea is abundantly formed when glucose, levulose, sucrose, dextrin, inulin, or even cellulose is oxidized in the presence of ammonia. Glycerin and formaldehyde gave similar urea production.

IV. *Demonstration of the presence of urea in the invertebrates* (pp. 673-676).—Urea was identified by the xanthydrol method in coelenterates, echinoderms, worms, crustaceans, insects, and mollusks.

V. *Urea in plants* (pp. 739-755).—The presence of urea was demonstrated in many of the common vegetables and food plants, such as spinach, carrots, turnips, potatoes, cauliflower, melons, and pumpkins. It is indicated that the property to synthesize urea is possessed not alone by higher plants, but also by molds. Urea was also found in germinating grains and in inactive seeds. During germination an accumulation of urea was observed in the embryo, while it occurred in only very small amounts or was practically absent in the cotyledons. Since the presence of urea has been demonstrated in plants, it is indicated that both urea and urease must be present in the material simultaneously. The function of the urease is deemed to be that of transforming into ammonia and rendering assimilable the urea contained in the plant.

Comparative analyses of fibrin from different animals, R. A. GORTNER and A. J. WUERTZ (*Jour. Amer. Chem. Soc.*, 39 (1917), No. 10, pp. 2239-2242).—The authors, at the Minnesota Experiment Station, prepared fibrin from the blood of cattle (two samples), sheep, and swine, and determined the nitrogen distribution by the Van Slyke method (*E. S. R.*, 26, p. 22).

The analytical results obtained showed no differences between the various samples significantly greater than the usual experimental errors. From the results it appears that "fibrin from any of these sources can be used interchangeably in experimental work without invalidating the results. Whether or not this is true for fibrins from other sources remains still an open question."

The data are reported in tabular form.

The relative influence of microorganisms and plant enzymes on corn silage fermentation, A. R. LAMB (*Iowa Sta. Research Bul. 40 (1917), pp. 313-332, figs. 13*).—This material has been noted from another source (*E. S. R.*, 36, p. 802).

Note on orange pip oil, DOROTHY G. HEWES (*Analyst, 42 (1917), No. 497, pp. 271-273*).—The author has examined a sample of orange seeds obtained as a by-product in the production of marmalade. The seeds consisted, in parts by weight, of kernel 60 and shell 31 per cent, and yielded on extraction with petroleum ether 37.5 per cent of a golden yellow oil equivalent to 64.95 per cent of the weight of the kernels. The oil was almost odorless and when freshly extracted had only a slightly bitter flavor. The bitterness, however, increased considerably and rapidly on keeping.

The following constants were obtained: Saponification value, 193.7; unsaponifiable matter, 0.14 per cent; iodine value, 100.3; refraction at 40° C., 0.875; free fatty acids, as oleic, 0.3 per cent; specific gravity at 15°, 0.9208; titer test, 34°; neutralization value, 200.1.

It is indicated that since the oil is easily saponified it should prove suitable for soap and glycerol manufacture.

Some factors influencing the quantitative determination of nitric nitrogen in the soil, J. E. GREAVES and C. T. HIRST (*Soil Sci., 4 (1917), No. 3, pp. 179-205, figs. 2*).—In the course of investigations the authors, at the Utah Experiment Station, found that clear soil extracts could be obtained by adding 2 gm. of lime, ferric sulphate, ferric alum, sodium alum, or potassium alum to the soil-water mixture, by filtering through the Chamberland-Pasteur filter, or by centrifugalization.

The use of alum, the Pasteur filter, or centrifugalization yielded a clear solution with a minimum loss of nitric nitrogen. The use of calcium oxid yielded a clear supernatant solution, but the quantity of nitric nitrogen obtained from such a solution was low. This is conceded not to be entirely due to the mechanical removal of the nitric nitrogen with the precipitated colloid, for similar results were obtained when calcium oxid was added to a clear sodium nitrate solution. The ratio of soil to water was found not to have any great influence on the quantity of nitric nitrogen obtained, since the same amount was obtained from the soil when the ratio varied from as low as 1:5 to as high as 1:25. No increase in nitrogen was obtained by shaking more than five minutes, provided the soil was well pulverized and thoroughly agitated.

Chlorids, sulphates, or carbonates of sodium, potassium, calcium, magnesium, manganese, and iron were indicated as not interfering with the Ulsch reduction method (*E. S. R.*, 3, p. 654). The presence of urea or glycocoll, however, yielded high results unless the solution was evaporated to dryness before reduction. No loss of nitric nitrogen was observed when such a solution was evaporated to dryness. "When dried blood is mixed with a nitrate less than 100 per cent of the nitric nitrogen is recovered by this method. There can be but little doubt that this is due to the reacting of nitrate with the proteins of the blood. If the resulting compound is insoluble it will settle from the supernatant liquid and thus be lost, while, if soluble, subsequent reduction will fail to liberate the nitric nitrogen; hence we would find the same error entering with any of the other methods."

The aluminum reduction method, as modified by Burgess (*E. S. R.*, 31, p. 206), permits of an appreciable loss of nitric nitrogen. This is obviated, however, by the use of the iron reduction method, which is outlined as follows:

One hundred gm. of finely ground soil, together with 500 cc. of distilled water, are placed in quart Mason jars and agitated for five minutes, preferably in a shaker. The solution is then clarified by either the addition of 2 gm. of alum

with the soil, filtering through the Chamberland-Pasteur filter, or by centrifugalization. When alum is used no other antiseptic is necessary, but unless the analysis is to be completed at once 0.5 cc. of chloroform should be added to each sample.

An aliquot part (100 cc.) of the supernatant liquid is evaporated with 2 cc. of a saturated solution of sodium hydroxide to about one-fourth its original volume, and if urea is present, to dryness. The neck of the reduction flask is fitted with a two-hole stopper through which passes a 50-cc. separatory funnel and a bent tube which dips into a vessel containing water to prevent mechanical loss. The residue is transferred to the reduction flask with 50 cc. of ammonia-free water and 5 gm. of "iron-by-hydrogen" and 80 cc. of sulphuric acid (specific gravity 1.35) then added. The acid should be slowly added and allowed to stand until the rapid evolution of hydrogen is over and then heated to boiling for 10 minutes. The contents of the side vessel should be returned to the reduction flask before the reaction is complete to insure the complete reduction of any nitrates which may have been carried over with the first violent evolution of hydrogen. When the reduction is completed the contents of the flask are transferred to a Kjeldahl flask, neutralized with sodium hydroxide, and distilled into standard acid. The excess of acid is titrated back with standard alkali, and lacmoid used as the indicator. Proper checks should be made on all reagents, including the alum used as a flocculent.

A bibliography of 58 references to the literature cited is appended.

Note on the Blacher method for the determination of hardness in water. A. D. BEHRMAN (*Philippine Jour. Sci., Sect. A, 11 (1916), No. 6, pp. 291-293*).—The author briefly notes the results obtained in a study of the effect of free carbon dioxide, removal of carbon dioxide, effect of sodium chloride, and the effect of dilution of very hard water on the determination of hardness by the Blacher method (*E. S. R., 31, p. 502*).

A modified procedure for the determination of hardness in water based on the data obtained in the above study is outlined.

A rapid volumetric method for the approximate estimation of chlorine in milk, B. W. HAMMER and D. E. BAILEY (*Iowa Sta. Research Bul. 41 (1917), pp. 337-348*).—The relation of high chlorine content to abnormal flavors and odors of milk and the literature pertaining thereto are briefly discussed.

In the study reported data were obtained by direct titration of the chlorine in milk with silver nitrate, using potassium chromate as indicator, and by determining the chlorine in the ash by the Volhard method. Consistently higher results were obtained on 49 samples of milk by the direct titration method than by the ashing method. Examination of the differences between the results obtained by the two methods indicates that the direct titration of milk with standard silver nitrate gives a satisfactory comparative index of the chlorine content of the sample. By subtracting 0.025 per cent from the results obtained in the direct titration procedure, results approximating those secured by the ashing method are obtained. The direct titration procedure outlined is as follows:

A 5-cc. sample of milk is placed in a porcelain dish with 50 cc. of distilled water and 1 cc. of a 10 per cent potassium chromate solution. The standard silver nitrate solution is added with stirring until there is a distinct change in color. The solution used was made so that 1 cc. equaled 0.01 per cent chlorine and contained 2.4722 gm. of silver nitrate per liter.

The chlorine content of the samples examined by the ashing method varied from 0.0504 to 0.104 per cent and averaged 0.0968 per cent. In an attempt to determine whether the phosphates, the fat, or the casein were responsible for

the high results obtained by the direct titration procedure, the casein was found to be apparently responsible to the largest extent.

The analytical data are submitted in tabular form.

The influence of raffinose of beet molasses on the exact polarization before and after inversion by acid or invertase, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill.*, 35 (1916), No. 4-6, pp. 112-117).—Data are submitted which show the effect of raffinose on the determination of sucrose in beet molasses by inversion.

An increased polarization was observed whether the inversion was brought about by means of acid or invertase. In the determination of sucrose in beet molasses the quantity of raffinose present must be deducted from the result obtained by direct polarization to obtain the exact amount of sucrose present.

Some tabular data showing the difference in polarization in the presence of varying amounts of raffinose are submitted.

Pentose content of beet molasses, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill.*, 35 (1916), No. 4-6, pp. 117-121).—This is a general discussion, together with the description of a procedure for determining pentoses in beet molasses.

Methods for approximating the relative toxicity of cottonseed products, F. E. CARBOTH (*Jour. Biol. Chem.*, 32 (1917), No. 1, pp. 87-90).—The author, at the North Carolina Experiment Station, notes that on cooking cotton seed with moist heat, as is done in the hot pressing processes preparatory to expressing the oil, the glands containing gossypol are disintegrated and the substance is spread over the surface of the seed tissue and apparently undergoes a change which is assumed to be a partial oxidation. The change takes place very quickly under suitable conditions, so that some meals which have been cooked only 20 to 30 minutes are not markedly toxic for rats. The changed gossypol is no longer soluble in ether and oil, possibly because it is in some way chemically combined with some constituent of the meal, probably the protein. Its presence can be demonstrated, however, in ether-extracted cottonseed meal by treating with hot alcoholic potash. The supernatant liquid contains the substance, which, like gossypol, soon oxidizes with the production of a beautiful blue color. This substance is much less toxic than the original gossypol. The author has termed this less toxic and soluble form "D" gossypol.

For determining the presence of the highly toxic gossypol the following test is outlined: A very small amount of the meal is sprinkled on a glass slide and touched with a drop of concentrated sulphuric acid and the material observed immediately through the low power of the microscope. The presence of the toxic unchanged gossypol is indicated by numerous red areas which appear where the acid touches the more or less ruptured cells. Thoroughly cooked meals and cottonseed flour are indicated as showing very few and very small red areas. A relatively large number of red areas are, however, observed in meals cooked with insufficient moisture or for too short a time.

For the quantitative determination of gossypol present in cottonseed meal, anilin has been found to be a suitable precipitant of the material from an ether extract. In the procedure 200 gm. or more of cottonseed meal is extracted for two to three hours with ether, so as to yield from 5 to 10 gm. of oil. The meal may be percolated or shaken with ether in a flask. The extract is evaporated to a small volume, filtered, and anilin (about 10 per cent of the weight of the extract) added, and the mixture warmed on the water bath, set aside, and allowed to stand for some time. If gossypol is present, a yellow microcrystalline precipitate of the anilin compound results. This substance appears to be the dianilin salt and is indicated as having the formula $C_{25}H_{20}O_2 \cdot 2C_6H_5NH_2$. In case a sufficient amount of the precipitate is obtained it may be filtered through a tared Gooch crucible, washed with a mixture of ether and petroleum

ether (1:2), and then washed with petroleum ether alone and dried at 100° C. The weight of the precipitate is converted to the weight of the gomypol by the use of the factor 0.74.

Tabular data comparing the sulphuric acid test for gomypol and the percentage of gomypol with the toxicity of the cottonseed product are submitted.

Single variety ciders and perries, B. T. P. BARKER and O. GROVE (*Jour. Bath and West and South. Counties Soc.*, 5. ser., 11 (1916-17), pp. 139-145; *Univ. Bristol. Ann. Rpt. Agr. and Hort. Research Sta.*, 1916, pp. 10-15).—Tabular data of the chemical composition and other particulars of the ciders and perries made during 1915-16 are submitted.

Home uses for muscadine grapes, C. DEARING (*U. S. Dept. Agr., Farmers' Bul.* 859 (1917), pp. 23, figs. 4).—This discusses and gives directions for making muscadine grape products, primarily for home consumption. The topics treated are sirup, unfermented grape juice, jelly, canned grapes, spiced grapes, catsup, conserves, preserves, jam, marmalade, mincemeat, and flavoring sirup.

Successful canning and preserving, OLA POWELL, edited by B. R. ANDREWS (*Philadelphia and London: J. B. Lippincott Co.*, 1917, pp. XIX+371, pls. 4, figs. 164).—This volume discusses the subject under the following chapter headings: History of the development of scientific canning; bacteriology as applied to canning; preparation and equipment; canning in tin; canning in glass; processing—hot-water bath; processing at high temperature; fruit juices; fruits for canning; vegetables for canning; preserves; marmalades, jams, and conserves; jelly making; pickling; drying fruits, vegetables, and herbs; preservation of meats; use of fruits and vegetables in the diet; canning club organization; the business side of canning; and teaching canning and related activities. Each chapter is followed by a number of questions which bring out the important points of the subject matter treated in the chapter and also a bibliography. An appendix is included containing the address of the various State institutions from which agricultural extension work is directed and also lists of firms furnishing supplies for canning and preserving.

Removal of stains from clothing and other textiles, H. L. LANG and ANNA H. WHITELSEY (*U. S. Dept. Agr., Farmers' Bul.* 861 (1917), pp. 35, figs. 3).—The general principles of stain removal are given, as well as specific methods for removing a large number of individual stains.

METEOROLOGY.

The sun and the weather, C. G. ABBOY (*Sci. Mo.*, 5 (1917), No. 4, pp. 400-410).—This is a plea for more systematic, widespread, and accurate daily solar constant measurements in the most cloudless regions of the earth like those now being made by the Smithsonian Institution at Mount Wilson, Cal., and Hump Mountain, N. C. It is stated that since the outstanding unexplained departures from mean daily temperatures, as illustrated in this paper, for Leavenworth, Paris, and Sydney "are seldom of much greater magnitude than the changes which are found by Clayton to be produced by changes in the sun, and as the maximum effects of solar changes follow from one to five days after the cause, depending on the latitude of the station, it may be possible that a very large proportion of weather changes will become predictable for some time in advance, if daily measurements of the solar emission shall be secured."

Sunspots, climatic factors, and plant activities, J. A. HARRIS (*Amer. Nat.*, 51 (1917), No. 612, pp. 761-764).—Reviewing various observations on this subject, the author reaches the conclusion that "the relationship between the number of sunspots and the annual record of terrestrial meteorological phe-

nomena is very slender indeed." The correlations for rainfall and barometric pressure are especially low. "The correlation between number of sunspots and terrestrial temperature is the most consistent and substantial of the three. The coefficients average about -0.14 ."

It is thought that there is very little hope that the biologist will be able to correlate plant activities with sunspot numbers "unless light intensity be the means of solar influence."

The alleged influence of gunfire on rainfall, H. DESLANDRES (*Compt. Rend. Acad. Sci. [Paris]*, 185 (1917), No. 9, pp. 304, 305; *abs. in Rev. Sci. [Paris]*, 55 (1917), No. 17, p. 641; *Nature [London]*, 100 (1917), No. 2503, pp. 131, 132).—The author is of the opinion that while gunfire may not be a primary cause of rainfall, it may intensify the rainfall when conditions are otherwise favorable by increasing ionization of the atmosphere (E. S. R., 37, p. 418). A statement by Saint-Saëns bearing on the matter is quoted.

Gunfire and rainfall, G. BARRE (*Rev. Gén. Sci.*, 28 (1917), No. 21, pp. 607-610).—Various contributions to this subject are briefly reviewed and the conclusion is reached that the evidence regarding relationship is inconclusive. In any case the matter is considered of less practical importance than many other unsettled questions relating to rainfall.

Studying the science of evaporation (*Sci. Amer.*, 117 (1917), No. 17, pp. 313, 317, figs. 2).—A brief reference is made to the establishment by the U. S. Weather Bureau of a number of small evaporation plants at various stations in the country, where it is proposed to keep detailed records of evaporation in much the same way as in case of temperature and rainfall.

"For its new work the Weather Bureau has devised a standard type of plant, which can be manufactured at low cost and which will insure uniform observations in all parts of the country. The main part of the equipment consists of a galvanized iron tank, 4 ft. in diameter and 10 in. deep. In order to provide an unrippled water surface when the measurements are taken, a metal tube, or well, is kept standing in the tank. Of course it is open at both ends, so that water rises to the same height in the tube as it does in the tank, but naturally it is not affected by the wind. It is an easy matter to reach down in this tube with a measuring rod and get the depth of water. By taking readings at regular intervals the amount which has evaporated can be determined. Of course, in case of rain, proper deductions must be made, and for that reason a rain gauge forms part of the equipment. A wind gauge, or anemometer, is mounted at one side of the tank, and maximum and minimum thermometers are also provided in an inclosed shelter."

On evaporation from a circular water surface, NESTA THOMAS and A. FERGUSON (*Phil. Mag. and Jour. Sci.*, 6. ser., 34 (1917), No. 202, pp. 308-321).—This article deals with certain elements of uncertainty in the calculation of the rate of evaporation from circular water surfaces, reviews work already done on the subject, and describes some experiments which were made on the evaporation from circular water surfaces under "everyday conditions." The subject is treated from the purely physical side.

Soot-fall studies in St. Louis, E. L. OHLE and L. McMASTER (*Wash. Univ. [St. Louis] Studies*, 5 (1917), 1, No. 1, pp. 3-8, pls. 5).—The soot fall was collected at 12 different places in the city during one year by means of cans 10 in. high and 4 in. in diameter, placed on buildings at least two-stories high and which were not sheltered between taller buildings. The amount of soot so collected varied from 506 to 905 tons and averaged 812 tons per square mile per year, the total soot fall for the city being 49,870 tons.

California earthquakes during 1916, A. H. PALMER (*Bul. Seismol. Soc. Amer.*, 7 (1917), No. 1, pp. 1-17, pl. 1).

Ohio weather for 1916, W. H. ALEXANDER and C. A. PATTON (*Ohio Sta. Bul.* 314 (1917), pp. 617-697, figs. 63).—Tables showing temperature and rainfall for the entire State in comparison with similar data recorded at the station are supplemented by a series of diagrammatic maps showing the comparative weather conditions for the various sections of the State.

The mean temperature for the year at Wooster was 49.9° F.; for the State, 51°. The highest temperature at the station was 96°, August 21; for the State, 104°, August 21. The lowest temperature at the station was -7°, February 22; for the State, -18°, February 14. The annual rainfall at the station was 34.93 in.; for the State, 37.24. The number of rainy days at the station was 141; for the State, 119. The prevailing direction of the wind was southwest at the station and in the State at large.

Weather notes, 1916, E. OLIVER (*Saskatchewan Dept. Agr., Ann. Rpt. Sec. Statist.*, 10 (1917), pp. 26-45).—Brief notes are given on the characteristic features of the weather for each month of the year and data for rainfall at different places in Saskatchewan are tabulated.

The weather of the past agricultural year, F. J. BARNES (*Jour. Roy. Agr. Soc. England*, 77 (1916), pp. 120-129).—Data on temperature, rainfall, and sunshine during 1916 and preceding years are given for the British Isles, and the characteristic features of the weather during the different seasons of 1916 are discussed with particular reference to their effect on crop production.

The weather of Scotland in 1916, A. WATT (*Trans. Highland and Agr. Soc. Scot.*, 5, ser., 29 (1917), pp. 274-286).—This report consists as usual of (1) a general description of the weather over the Scottish area from month to month and (2) a selection of rainfall returns, in which each county in Scotland is represented by one or more stations. Outstanding features of the weather of 1916 were the prolonged spell of wintry weather in February and March which put a stop to agricultural operations, the cold spell in June, and a general deficiency of sunshine.

SOILS—FERTILIZERS.

Studies on the Paleozoic soils of North Wales, G. W. ROBINSON (*Jour. Agr. Sci. [England]*, 8 (1917), No. 3, pp. 333-384, figs. 2).—This is a report of studies of the general characteristics of the soils of the counties of Anglesey, Carnarvon, and Denbigh, in North Wales, in which the main soil types are described, including soils derived from the weathering of local glacial drift, and the associated sandy, alluvial, and peaty soils.

With the exception of sands, alluvia, and peats, the soils of the area are of loam texture, and clay soils are rare. "The clay fraction rarely exceeds 10 per cent in the case of soils derived from the shale, or 7 per cent in the case of the Anglesey and Carnarvonshire loams. Usually the clay fraction falls considerably below these figures. The silt fractions, on the other hand, particularly in the Paleozoic silt loam, form a considerable proportion of the soil." Sedentary soils and soils derived directly from local drift deposits contained remarkably high proportions of fine gravel. This was particularly the case in the subsoils. One sedentary soil in Carnarvonshire contained over 40 per cent of fine gravel in the subsoil.

Analyses of a number of the fractions obtained in mechanical analysis showed that these soils were poorer in silica and richer in alumina and ferric oxide than English soils. "The most notable difference, however, is that in the Welsh soils the most siliceous fraction is never the fine gravel as in the Graibstone and English soils. . . . The highest percentage of silica is found in the coarse sand in four cases, in the fine sand in three cases, and in the silt in three cases."

These soils were also generally deficient in calcium carbonate, and contained relatively large amounts of organic matter and potash. The phosphoric-acid content was relatively high in the silt loams and low in the sands.

The influence of soil conditions on the decomposition of organic matter in the soil, E. J. RUSSELL and A. APPELYARD (*Jour. Agr. Sci. [England]*, 8 (1917), No. 3, pp. 385-417, figs. 9).—Studies conducted at the Rothamsted Experiment Station on the changes in bacterial numbers, nitrate content of the soil, and carbon dioxide content of the soil air are reported, these having been determined at frequent and regular intervals during several seasons on five different plots of land. The results are graphically presented.

"There is sufficient resemblance between the curves for bacterial numbers, carbon dioxide (except for a period on cropped land), and nitrate to justify the conclusion that they are all related. The curve for nitrate, however, is always behind that for bacterial numbers, the lag amounting to two or three weeks. Assuming . . . that the curves are connected, this would indicate two stages in nitrate production, one related to the bacterial numbers, the other not. . . .

"The biochemical decompositions in the soil are determined in the first instance by the temperature and do not proceed to any notable extent below 5° C. As soon as the temperature rises action begins rapidly; but it soon slows down and other factors begin to operate. Moisture is one of these. Action came to a minimum in June, when the moisture fell to 10 per cent by weight of the unmatured soil and 15 per cent by weight of the dunged soil, or 18 and 22 parts, respectively, by volume, assuming there was no contraction. Rainfall is an even more important factor, a shower of rain having a notable effect in starting the decompositions. It seems probable that the dissolved oxygen is an important factor here. The growing crop exerts a depressing effect, though whether by taking up the dissolved oxygen, by giving out carbon dioxide, or by some other action, is not clear. The fluctuations in bacterial numbers are not wholly explicable as functions of the temperature and moisture content."

Changes in the physical composition caused by the conversion of dry soil into paddy soil, W. H. HARRISON (*Madras Agr. Dept. Yearbook*, 1917, pp. 73-76).—Experiments are reported and the conclusions drawn that "wet methods of cultivation when first applied to dry soils tend, in the first instance, to bring about a redistribution of the soil particles between the soil and subsoil. The tendency is for the coarse particles to accumulate in the subsoil and the finer particles in the soil. Afterwards the main tendency is to cause a rapid breaking down or weathering of the particles both in the soil and subsoil, thus causing the soils to become heavier in character."

Forms of occurrence of phosphoric acid in soil, M. A. JIROVSKY (*Russ. Selisk. Khaz. Gaz.*, 1916, Nos. 13-14, pp. 4, 5; 15, pp. 4, 5; *abs. in Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 9, pp. 1248, 1249; *Jour. Soc. Chem. Indus.*, 36 (1917), No. 5, p. 298).—Experiments with podzol soil containing 0.0532 per cent phosphoric acid and two chernozem soils containing 0.145 and 0.11 per cent phosphoric acid are reported, in which the organically combined phosphorus was separated and estimated by washing the soil with 3 per cent hydrochloric acid and treating with 3 per cent ammonia solution, the resulting solution being then filtered and precipitated with lead acetate.

"The washed precipitate, freed from lead with hydrogen sulphide, was redissolved in dilute ammonia, the liquid filtered, concentrated, and finally extracted with ether, the organic phosphorus going into solution. . . . Of the total phosphoric acid in these soils, the ammonia solution removed about one-half in the first and third, and one-third in the second. The organic phosphoric acid extracted varied from 10 to 14.87 per cent of the total phosphoric acid.

Its nature varied with the source, but it is apparently related to the nucleic acids. The 3 per cent hydrochloric acid extract contained the element in both inorganic and organic forms and during its evaporation a considerable amount of the latter was converted into the former."

The phosphate depletion of the soils of Bihar: Its effect on the quality and yield of crops and the contingent risks of malnutrition and endemic disease in cattle and man, W. A. DAVIS (*Agr. Jour. India, Indian Sci. Cong. No., 1917, pp. 77-89*).—Evidence is given of a deficiency of phosphorus in Bihar soils, and the relation of this deficiency to malnutrition of cattle, low milk yield, and nervous diseases of horses is discussed.

(Experiments on alkali soil), D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 24, 25*).—The results of attempts to reduce the excessive amount of salts in a tract of land on the Huntley reclamation project and to grow crops on the soil are briefly described. The land was seriously affected by seepage due to a rapid rise of the ground water under this area in 1914 and 1915. As a result the amount of alkali salts has increased in the first 4 ft. of soil since 1913. The construction of a drain in 1915 relieved the condition, the ground water being lowered to a depth below 5 ft.

Alfalfa planted for seed on the soil in 1916 yielded a small amount of hay but practically no seed. Sweet clover made a heavy growth and yielded seed at the rate of 4.53 bu. per acre in 1916. From results secured in 1915 and 1916 "It appears to be one of the best crops for this heavy land, both as a seed crop and for hay and pasture."

The importance of mold action in soils, P. E. BROWN (*Science, n. ser., 46 (1917), No. 1182, pp. 171-175*).—This paper calls attention briefly to the varied action of molds in soils, and presents a compilation of various published data and some of the unpublished results of experiments on the subject conducted at the Iowa Experiment Station with the idea of emphasizing the need of further study of these organisms.

It is thought that fungi occur actively in soils and that their action must be important regardless of their relative numbers compared with bacteria. "It seems evident that mold action in soils may be of far greater significance than has previously been supposed in preparing available food for plant growth. . . . If soil bacteriology is to be developed to the proper extent in the future and the relation of microorganisms to soil fertility is to be established with any degree of certainty, investigations must include not only bacterial action, but the activities of molds and possibly also the growth of protozoa and algae."

Carbon dioxide production in soils and carbon and nitrogen changes in soils variously treated, R. S. PORTER and R. S. SNYDER (*Iowa Sta. Research Bul. 39 (1916), pp. 253-309, pl. 1, figs. 21*).—Following a review of the literature, experiments are reported in which it was found that calcium carbonate in the course of 124 days increased both the total amount of carbon dioxide evolved from soil and the amount given off by the organic matter in the soil. The same was true for the soils receiving applications of 10, 20, 30, and 50 tons of manure per acre. Less calcium carbonate was decomposed from the soils receiving manure than from the unmanured. The greater the application of manure the less was the decomposition of the carbonate. The ammonia evolved from the soil under the conditions of the experiment was negligible.

"It is believed that the conditions of this experiment approximate field conditions closely enough to venture the statement that under normal conditions there is no danger of the loss of nitrogen from the field by volatilization of ammonia. There was quite an accumulation of nitrates in the manured soils. Magnesium carbonate caused a somewhat greater accumulation of nitrates than

did calcium carbonate. The addition of large amounts of manure to the soil caused an increase in the total nitrogen after a period of about four months. It is suggested that this accumulation of nitrogen was caused by increased azulification due to easily available energy material added with the manure."

The nitrification of pyridin, quinolin, guanidin carbonate, etc., in soils, *Dr. J. Funchess (Alabama Col. Sta. Bul. 196 (1917), pp. 65-82).*—Continuing work previously noted (*E. S. R.*, 36, p. 212), experiments are reported on the nitrification of pyridin, quinolin, guanidin, carbonate, etc., in acid soils and acid sandy loams and to determine the effect of lime thereon.

It was found that "with the exception of naphthylamin, each of the compounds used was nitrified in soil. At the concentration used, naphthylamin inhibited nitrification in both limed and unlimed soil. Quinolin was nitrified most readily in soil having the highest lime requirement. Lime retarded or even inhibited nitrification of quinolin. Lime practically inhibited nitrification of guanidin carbonate. Nitrification of dried blood, piperidin, nucleic acid, alloxan, and asparagin was greatly increased by lime.

"Heavy applications of certain nitrogenous compounds may retard nitrification. Liming a soil which had been partially sterilized with carbon disulphid greatly increased its power of nitrification. A still further increase was obtained by re inoculation of the soil after partial sterilization.

"Vanillin proved to be nontoxic toward nitrification of piperidin, moderately toxic toward nitrification of dried blood and pyridin, and inhibitory toward nitrification of quinolin. Lime counteracted the toxicity of vanillin to a very large degree.

"The effect of coumarin on nitrification was quite variable. In some instances it exerted an inhibitory effect; in others none. In most cases where coumarin exerted an inhibitory effect, lime greatly reduced the amount of inhibition.

"Pyrogallol retarded nitrification of all compounds except quinolin and piperidin in one soil. Lime reduced the injurious effect of pyrogallol in all cases except in the quinolin-treated soil.

"Salicylic aldehyde completely inhibited nitrification of all compounds except piperidin in one soil.

"Carbon black apparently overcomes a part of the bad effect of certain non-nitrogenous compounds on the process of nitrification."

The maintenance of soil fertility, *C. E. Thorne (Agr. of Mass., 1916, pt. 2, pp. 33-48; Mass. Bd. Agr. Circ. 65 (1917), pp. 15).*—General principles for the maintenance of soil fertility are outlined as the results of experience at the Ohio Experiment Station.

Fertilizers as an aid to profitable farming, *G. C. Abbott (London: McGlashan, Gempory & Co., [1917], pp. 73).*—This is essentially a war-time publication apparently designed to give practical information as to the most efficient utilization of the available supplies of natural and artificial fertilizers for different crops under English conditions. Part I deals with plant food elements, their function and effects, and Part II deals with the value of experiments as indicating the profit resulting from the judicious use of suitable fertilizers.

Fertilizing California soils for the 1918 crop, *C. B. Lipman (California Sta. Circ. 170 (1917), pp. 8).*—This circular contains information and suggestions regarding proper systems of fertilization to be followed on California soils to meet war-time conditions. It is pointed out that the arid soils of California are particularly deficient in nitrogen and organic matter.

"In the soils of the San Joaquin Valley and in those of the southern valleys of California, including the southern coast valleys, the southern portion of the

Sacramento Valley, and in other places where the rainfall is below 16 in. per annum, it appears that a high-grade inorganic nitrogenous fertilizer is to be preferred to the organic forms and especially where quick results are desired. The best representative of the high-grade nitrogenous fertilizers for the class of soils under consideration here is sulphate of ammonia. It may be used on all crops in the case of these soils. Nitrate of soda may be used also in the case of grain soils with good effect. . . . On soils of the northern and northwestern counties of the State, including a considerable portion of the north half of the Sacramento Valley and in some of our more southern coast valleys, together with a few more isolated and limited districts all over the State, in which the soils contain more than the usual quantity of organic matter and of nitrogen, the high-grade organic nitrogenous fertilizers will serve as well. . . .

"In general phosphate fertilizers can not at the present time be made to yield profitable returns on the arid soils of California." This is attributed to the relatively great depth of the soil and the consequently larger plant-feeding area.

"With the possible exception of the delta soils . . . It seems quite certain that potash fertilizers can not be made to return profitable yields on arid California soils. In addition, it also seems true that the size of the crop may not be materially increased by the use of potash fertilizers, even without profit."

Fertilizer experiments (Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 24-45, figs. 11).—Fertilizer experiments on both upland and muskeg with field and truck crops are reported.

No marked improvement in crop yields has so far been shown from any fertilizer except barnyard manure on upland soil. On muskeg, liming showed marked beneficial results on practically all crops, grains, grasses, and vegetables. The effect of lime on the stand of grasses, legumes, and weeds was striking. The fertilizer treatments on muskeg have not been run long enough to give conclusive results. A test of vegetables on muskeg showed more marked beneficial results from fertilizer treatment on deep peat than on shallow peat. This was especially true in the use of lime.

The value of activated sludge as a fertilizer, W. D. HATFIELD and E. BARROW (Univ. Ill. Bul., 14 (1916), No. 5, pp. 336-347, figs. 4).—This is an abstract of a thesis containing a summary of different experiments on the subject, showing that the nitrogen in activated sludge is in a very available form and that activated sludge is valuable as a fertilizer. Calculations based on comparison with dried blood show that activated sludge should be worth about \$20 a ton.

See also a previous note by the authors on this subject (E. S. R., 34, p. 520).

Experiments in the bacterization of peat for soil fertilizing purposes, D. H. JONES (Abs. Bact., 1 (1917), No. 1, pp. 43, 44).—In an endeavor to substantiate Bottomley's claims regarding the preparation and value of bacterized peat as a soil fertilizer, some experiments were conducted on the bacterial and chemical treatment of peat, following the method practiced by Bottomley.

A sample of peat was divided into five 1-bu. lots. Lime in varying quantities was added to three of these and then they, and one of the remainder, were inoculated with rich broth cultures of soil bacteria, the fifth lot being kept as control. All were incubated at 25° C. for one month, being moistened and mixed up occasionally to aerate. All samples were then autoclaved at 15 lbs. for one hour. Rich cultures of *Azotobacter*, *Pseudomonas radiicola*, and cellulose fermenting bacteria were then added to all except the control and incubated at 25° for two months.

Different lots of the peat were mixed in the percentages of 0.5, 2, and 10, with a sample of poor soil, and filled into 7-in. flower pots, and in these radish seed

was sown. After one month's growth a marked difference in size and greenness of foliage in favor of the bacterized peat (10 per cent application) was noticed. After three months' growth the final examination showed as a rule greater development both of foliage and roots for the bacterized peat samples than for the control, the heavy application of peat (10 per cent) giving more than 100 per cent increase of plant by weight. The addition of lime to the peat did not appear to have much, if any, beneficial effect.

It would appear from the above that the bacterial treatment to which this sample of peat was subjected was beneficial in making the peat useful as a fertilizer. But as heavy applications, i. e., 10 per cent by weight of soil, were necessary to give marked beneficial results, the expense of preparation may preclude its general application to the soil as a fertilizer.

Study of the nitrification of different leathers available for agricultural use, and of sulphureted rape cakes, GULLIN (*Compt. Rend. Acad. Agr. France*, 2 (1916), No. 27, pp. 760-763; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 9, pp. 1253-1256; *Jour. Soc. Chem. Indus.*, 36 (1917), No. 5, p. 299).—Nitrification experiments are reported with clayey lime soil which was treated with dried blood, tanned leather, chrome leather, roasted leather, leather waste treated with sulphuric acid, leather waste treated with sulphuric acid and liquefied, and sulphureted rape cake, containing, respectively, 11.72, 8.15, 8.87, 6.77, 6.63, 7.36, and 5.62 per cent of nitrogen. These materials were added in amounts equivalent to 1 gm. of nitrogen per kilogram of soil, and nitrate determinations were made at intervals of one, two, and five months. The following table shows the amounts by weight of nitrates found after one and three months:

Nitrification experiments.

Nitrogenous material.	Weights of nitrates found.	
	After 1 month.	After 3 months.
	Grams.	Grams.
Blood.....	1.080	2.473
Tanned leather.....	.166	.404
Chrome leather.....	.003	.227
Roasted leather.....	.229	.528
Dissolved leather (paste).....	.742	1.547
Dissolved leather (liquid).....	.990	2.015
Rape cake.....	.888	2.291

"The effects of chrome leather and of dissolved leather upon the growth of young wheat plants were investigated in pot experiments. Ten weeks after germination the crops were weighed, and taking the weight of the control plants as 100, that treated with chrome leather was 30, and that with dissolved leather 115. Chrome leather is, therefore, injurious to vegetation. Neither tanned leather nor roasted leather are suitable soil amendments. Under very favorable conditions of nitrification, the former gave 0.021 and 0.078 gm. of nitric acid after one and five months, respectively, and the latter 0.075 and 0.197 gm. per gram of fertilizer nitrogen applied. Leather which has been thoroughly decomposed with sulphuric acid is a useful fertilizer."

Action of ammonium salts on the growth of barley, H. G. SÖDERBAUM (*K. Landtbr. Akad. Handl. och Tidskr.*, 55 (1916), No. 1-2, pp. 57-66, figs. 2; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 7 (1916),

No. 9, pp. 1275-1278).—Experiments with barley on sandy loam soil fertilized with potash and different phosphates, and to which were added sodium nitrate ammonium chlorid, and ammonium sulphate separately in amounts corresponding to 134 lbs. of nitrogen per acre, are reported.

It was found that both where superphosphate and bone meal were used, the ammonium salts produced results inferior to those produced by nitrate. On the whole, better results were obtained with ammonium chlorid than with ammonium sulphate. Where bone meal and ammonium salts were used the addition of magnesium carbonate increased the yield, but where bone meal was used with sodium nitrate the addition of magnesium carbonate decreased the yield. Where basic slag was used there was little difference between the results obtained with ammonium salts and sodium nitrate.

It is concluded that "the hypothesis of a progressive acidification of the substance of the plants must be dismissed, and it is more in keeping with the facts to assume that what really takes place is a poisonous action of the ammoniacal salts exerted direct on the plant. Recent experiments appear to show that the carbonates of calcium and magnesium promote the processes of nitrification by bringing about the transformation of the injurious ammoniacal salts into nitrates which are not injurious, hence their beneficial action."

Manufacture of synthetic nitrates by electric power, E. K. SCOTT (*Jour. Soc. Chem. Indus.*, 36 (1917), No. 14, pp. 771-777, figs. 7; *abs. in Sci. Abs., Sect. B—Elect. Engin.*, 20 (1917), No. 10, p. 369).—This is a discussion of different processes and equipments for manufacturing synthetic nitrates by electric power, and includes a comparison of these with the so-called indirect methods involving the manufacture of calcium carbide and cyanamid and the oxidation of ammonia.

Manganese as a catalyst in atmospheric nitrogen fixation by plants through bacterial agencies, A. DE G. ROCASOLANO (*Rev. R. Acad. Cien. Madrid*, 14 (1916), No. 10, pp. 681-693, fig. 1; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 9, pp. 1256, 1257; *Jour. Soc. Chem. Indus.*, 36 (1917), No. 5, p. 299).—"Quantities of 100 cc. of culture bouillon of known nitrogen content and containing mannitol and varying amounts of manganese chlorid were inoculated with pure cultures of *Bacillus radicicola*, *Clostridium pasteurianum*, and *Azotobacter chroococcum*, incubated at 22-23° C. for 25 days, and after sterilization analyzed for total nitrogen by Kjeldahl's method. With the exception of *B. radicicola* the organisms did not function in the total absence of manganese, but in all cases its presence accelerated nitrogen fixation, the optimum quantity being 0.006 gm. of manganese ion per 100 cc. of bouillon. With this amount three times more nitrogen was fixed than in the control vessel. Acceleration was retarded when the manganese exceeded the optimum, and with 0.02 gm. the fixation itself was retarded.

"Under field conditions crops would be stimulated by fertilizers containing manganese in amount not exceeding 0.006 gm. per 100 gm. of soil. Most soils already contain more than this amount of manganese, but it is mostly in an unavailable form. In estimating the quantity of this catalyst to be applied, the amount already present in a soluble form must be taken into consideration."

Reversion of acid phosphate, C. C. JAMES (*Jour. Indus. and Engin. Chem.*, 9 (1917), No. 7, p. 682).—It was found that by the addition of 25 gm. each of calcium oxid, unground coral sand, and unground brown guano, separately, to 475 gm. of acid phosphate the reversion of the phosphate with the coral sand was 0.62 per cent in 5 days and 0.86 per cent in 20 days. With brown guano the reversion was not so great, and with lime it was 3.75 times as much.

Notes on the greensand deposits of the eastern United States, G. H. ASHLEY (*U. S. Geol. Survey Bul.* 666-B (1917), pp. 27-58, pl. 1, fig. 1).—This report deals with the greensand deposits of New Jersey, Delaware, Maryland, Virginia,

North Carolina, Tennessee, and Arkansas, with particular reference to the amount and solubility of their potash contents.

The descriptions and analyses indicate that the best greensands are in New Jersey and Delaware. The deposits in places have a maximum thickness of 20 or 30 ft., though as a rule it is less, and a horizontal extent of many miles. The quantity varies both in different parts of the section of the bed at the same place and from place to place. In the main these beds outcrop at the surface and have a cover as a rule not more than their own thickness. Locally they carry more than 7 per cent of potash, and over large areas they carry from 5 to 7 per cent of potash. Many of the deposits are close to transportation and so situated that they could be mined by dredge or steam shovel readily and cheaply. The deposits examined south of Delaware are of lower grade. It is considered probable, however, that all of those examined have a sufficient extent for commercial use, if a cheap method of obtaining the potash can be found.

With reference to the solubility of the potash "experiments were made in dissolving the potash of the greensand in a solution of carbon dioxide. An automatic agitator was used and the tests lasted several hours. The solution contained such a small amount of potash, however, as to indicate that the process was not commercially feasible. Similar experiments, with like results, were carried on with sulphur dioxide, which could be obtained as a by-product from the smelters, and dilute hydrochloric acid also failed to give results of value. . . . The results obtained do not lend hope to the successful use of such methods. . . . The advantage of greensand over feldspars lies in its abundance and possible low first cost, exclusive of freight."

An article is included on methods of analysis of greensand by W. B. Hicks and R. K. Bailey:

Manufacture of potash from feldspar (*Jour. Rd. Agr. [London], 23 (1917), No. 11, pp. 1087-1091*).—Tests with two British feldspars and a Swedish feldspar of the so-called Rhodin process for rendering the potash of feldspar soluble in water are reported. It was found that by this process 75 per cent of the potash content of certain feldspars can be obtained in soluble form, while the insoluble residues can be made into a white or nearly white cement, valuable for decorative purposes.

The recovery of potash as a by-product in the cement industry, W. H. Ross, A. R. Mezz, and C. R. WAGNER (*U. S. Dept. Agr. Bul. 572 (1917), pp. 22*).—"Analysis of samples of raw mix and of cement from 118 cement mills in the United States and Canada shows that the potash in the raw mix varies from 0.2 to 1.16 per cent, and that the percentage of potash volatilized in the different plants varies from 24.5 to 95.9 per cent. From the results thus obtained it has been calculated that the potash escaping from the kilns of these plants ranges from 0.35 to 5.14 lbs. per barrel of cement produced, with an average for the plants of this country of 1.93 lbs. On the basis of an average production of 90,000,000 bbls., the total potash escaping from the cement plants of this country amounts to about 87,000 tons annually. It has been demonstrated commercially that 90 per cent of the potash escaping in the dust is recoverable, and from experiments made in this laboratory it would appear that 95 per cent of the recoverable potash is, or may readily be made, available. . . . Assuming, in the light of results that have already been obtained, that it would be practicable to increase the percentage of potash volatilized to at least 65 per cent for all plants, then the available recoverable potash would amount to more than 100,000 tons annually, or to nearly one-half of the normal consumption of potash in this country.

"If it be assumed, further, that the dust escaping from the kilns amounts on an average to 4 per cent of the raw mix fed into the kilns in the case of dry-process plants, and to 2 per cent for plants using the wet process, then, on the basis of the results already given, the total potash content of the dust escaping from the former plants will vary in different plants from 1.4 to 20 per cent, and in the latter from 9.1 to 35.1 per cent.

"The ratio of potash to soda in the dust as determined for 20 different plants varies from 0.92 to 6.07, with an average of 2.66."

The recovery of water-soluble potash as a by-product in the cement industry, W. H. ROSS and A. R. MEER (*Amer. Fert.*, 47 (1917), No. 7, pp. 28-33).—This article is based on the investigations noted above.

The nature of cement mill potash, R. J. NESTELL and E. ANDERSON (*Jour. Indus. and Engin. Chem.*, 9 (1917), No. 7, pp. 646-651, fig. 1).—Studies of the potash content of cement mill dust and fumes are reported. It was found that dust from cement kiln gases may be composed of mechanically carried-over raw material and solid residues from fuel combustion, together with volatilized alkalis.

"Such dust contains considerable amounts of potash present both in readily and slowly soluble form. The readily soluble potash usually occurs as sulphate, due to a combination of this base with the sulphur of the fuel and, where there is a deficiency of sulphur, partly as carbonate. The slowly soluble potash is probably of a siliceous nature, largely formed by the union of potash vapor with incandescent ash particles. This siliceous potash becomes soluble on boiling with water for a few hours, and on treatment with cold water for longer periods. The presence of lime accelerates the solution. Slowly soluble potash compounds are also formed by the interaction of potash salts in solution with siliceous material, this recombination being greatly accelerated by heat. The action of moist soil promotes the availability of the slowly soluble potash. In view of the gradual and continued solution of the potash in cement kiln dust, it should be of particular value as fertilizer material."

Recovery of potash from beet and cane molasses in the United States, J. S. HOAN (*La. Planter*, 59 (1917), No. 8, pp. 122, 123).—Reviewing the subject from the practical standpoint the author concludes that the recovery of potash is very profitable in all distilleries at present, especially on large plantations where the alcohol can be used for motive power in tractors and in beet producing regions far from a potash supply. It is further thought that the process will always be profitable in the Hawaiian Islands and Australia for economic reasons.

Comparative fertilizing values of ground limestone and dolomitic limestone, H. VON FILLITZEN (*Svenska Mosskulturför. Tidskr.*, 30 (1916), No. 4, pp. 383-392, figs. 2).—Experiments comparing pure ground limestone with dolomitic limestone containing 55.09 per cent calcium carbonate and 41.66 per cent magnesium carbonate showed that the dolomite when well pulverized can be used with good results on soil poor in lime.

Lime on the farm, F. B. GUTHRIE (*Dept. Agr. N. S. Wales, Farmers' Bul.* 115 (1917), pp. 31).—This is a discussion of different forms of lime and their profitable utilization in agriculture, with special reference to New South Wales conditions.

Law in relation to commercial fertilizers (*Bul. Bd. Agr. Del.*, 6 (1917), No. 4, pp. 3-10).—The text of the Delaware fertilizer law is given, together with a copy of the rules and regulations to carry it into effect.

Commercial fertilizers, H. E. CURTIS ET AL. (*Kentucky Sta. Bul.* 205 (1916), pp. 397-538).—This is the fertilizer inspection and analyses report for Kentucky for 1916.

AGRICULTURAL BOTANY.

Dictionary of plant names, H. L. GERTH VAN WIJX (*The Hague: Martinus Nijhoff*, vol. 1, 1911, pp. XXIV+1444+V; vol. 2, 1916, pp. XXXIII+1696).—Volume 1 of this dictionary, which is published by the Dutch Society of Sciences at Haarlem, gives the English, French, German, and Dutch names of plants, the arrangement being according to the scientific names of the plants.

The second volume is an index of alphabetically arranged common names with their scientific equivalents. Native and local names are also freely given.

Notes on new or rare species of *Ravenelia*, W. H. LONO (*Bot. Gaz.*, 64, 1917, No. 1, pp. 57-60).—To the new species of *Ravenelia* which he has previously recorded (*E. S. R.*, 36, p. 145) the author now adds *R. hoffmanseggiae*, *R. siderocarpus*, and *R. prasopidis*. He also discusses *R. rameriana*, *R. mesliniana*, *R. siliqua*, *R. australis*, *R. gracilis*, and *R. leuconia*.

Plants, seeds, and currents in the West Indies and Azores, H. B. GUPPY (*London: Williams and Norgate*, 1917, pp. XII+531, pls. 4).—The observations reported as carried out in association with the author's work on seeds and fruits which has been noted previously (*E. S. R.*, 27, p. 729), extended over a period of about eight years. He has also drawn freely for illustrative data upon the contributions of others, lists of which are furnished. An extended study was made of the stranded seed and fruit drift of the West Indian region and of that on European shores as a means of approach to the problems of plant distribution. The similarity between the African and the West Indian littoral zones is explained in connection with what is known of ocean currents in this region. He holds, as a most important teaching from his study, that living plants afford testimony which is often as insistent as is that of the rocks as to past changes in the arrangement of land and water.

Observations on a new type of artificial osmotic cell, J. ROBERT (*Plant World*, 20 (1917), No. 2, pp. 37-57, figs. 3).—The author describes a modification of Traube's cell for the illustration and study of osmotic phenomena. This modification is said to be adaptable and convenient.

Into a mixture of the solutions of sodium silicate and sodium salicylate a crystal of potassium permanganate is dropped. The quick formation and rupture of the sac which develops around the crystal is followed by the formation of a protuberance which becomes elongated into a stem, the structure, behavior, and management of which are discussed.

The osmotic concentration of the tissue fluids of Jamaican montane rain forest vegetation, J. A. HARRIS and J. V. LAWRENCE (*Amer. Jour. Bot.*, 4 (1917), No. 5, pp. 263-298).—This paper, the second of a series dealing with problems of osmotic concentrations in plant tissue fluids (*E. S. R.*, 33, p. 623), presents determinations of the freezing point lowering of extracted leaf sap of plants from the Blue Mountains of Jamaica, discusses the differences noted in connection with local differences in the environmental complex, and briefly compares the series as a whole with others now available.

The results of the present study (though showing less marked contrasts) are held to confirm the conclusions drawn from investigations of the deserts of northern Arizona as regards the existence of a higher osmotic pressure in the tissue fluids from the leaves of ligneous plants than in those from herbaceous plants. The four subhabitats recognized in the Blue Mountains show distinct differences in the concentration of their tissue fluids. The ruinate, regarded as the most xerophytic of the habitats, shows a distinctly higher concentration of leaf tissue fluids than does any other habitat. The ridge forest, the leeward vines, the windward ravines and slopes, and the windward habitats form a ascending series as regards sap concentration.

The osmotic concentration of the sap of plants in the Blue Mountains is the lowest yet extensively investigated, the ligneous forms averaging about 11.4 atmospheres and the herbaceous plants averaging about 8.6 atmospheres. These figures are compared with those from other series in other regions. These averages, though the simplest expression of regional differences, are admitted to be not adequately descriptive, as they conceal differences which obtain in each of the areas investigated. Further comparisons are to be presented later.

The relationship between the osmotic concentration of leaf sap and height of leaf insertion in trees, J. A. HARRIS, R. A. GORTNER, and J. V. LAWRENCE (*Bul. Torrey Bot. Club*, 44 (1917), No. 6, pp. 267-283, figs. 4).—The authors present data obtained from a study of the relationship between the height of insertion of leaves and the physicochemical properties of the leaf sap in trees growing in the open or in the woods.

Measurements made on 26 trees belonging to 12 species are said to show that almost without exception, the osmotic concentration of leaf sap (determined by the freezing-point lowering method) increases from lower to higher levels, while specific electrical conductivity shows a tendency, though less regular, to decrease from below upward. Almost without exception, the ratio of specific electrical conductivity to freezing-point lowering decreases from below upward.

The observed relationship of physicochemical properties to the level of leaf insertion is thought to be due to either internal or environmental factors. The probable bearings of the observed facts are discussed.

The effect of surface films of Bordeaux mixture on the foliar transpiring power in tomato plants, J. W. SHIVE and W. H. MARTIN (*Plant World*, 20 (1917), No. 3, pp. 67-86, fig. 1).—Extending the investigations reported by Martin (*E. S. R.*, 30, p. 454), and employing improved methods worked out by Livingston and Shreve (*E. S. R.*, 37, p. 26), but using in this work tomato plants in full bloom which had been grown under agricultural conditions in the open field, the authors state that the indices of transpiring power of the leaves treated with Bordeaux mixture range from 18 to 29 per cent higher than those of the untreated leaves. The maximum indices in foliar transpiring power for all occur near the middle of the day, and the influence of the Bordeaux mixture in raising the index is as pronounced when the indices are low as when they are high.

Permeability of membranes as related to their composition, F. E. DENNY (*Bot. Gaz.*, 63 (1917), No. 6, pp. 468-485, figs. 6).—The author describes a study of questions raised in the course of a previous investigation (*E. S. R.*, 38, p. 25) regarding the identity and the relative importance of the substances determining the rate of passage of water through membranes. Seed coats from various economic plants were used. An account is given of factors and treatments influencing permeability.

The substances affecting the permeability of the membranes to water were lipoids, tannins, and pectic substances. Soluble proteins were not detected. Suberized layers were not significant in this connection.

Resistance of seed coats of *Abutilon theophrasti* to intake of water, W. E. DAVIS (*Bot. Gaz.*, 64 (1917), No. 2, pp. 166, 167).—The results of tests with seeds of *A. theophrasti* covered with water in stoppered vials in 1910 and removed as they were found to have swollen and with seeds collected in 1916 from plants standing in the field are said to indicate a wide range in the resisting power of the coats of these seeds to water intakes. It is thought that many of the more resistant seeds lie in the soil for many years before germination can take place.

The viability of radish seeds (*Raphanus sativus*) as affected by high temperatures and water content, H. D. WAGGONER (*Amer. Jour. Bot.*, 4 (1917), No. 4, pp. 299-313, fig. 1).—A study of seeds of *R. sativus* of several varieties is said to have shown that the viability of the seeds at given temperatures is lowered by a high initial water content of the seeds, and that, at a given water content, viability is lowered by an increase of temperature. Seeds injured by high water content or high temperature suffer retardation in germination, which shows a direct relation to these readings. Radish seeds of equal initial water content show very much greater resistance to heat in dry-corked flasks than in water, and still greater in open dishes in ovens. The amount of water absorbed or given up by the seeds during treatment appears to be the chief determining factor as regards the development of resistance. Seeds heated in water lose increasingly in dry weight with rise of temperature.

The influence of light on the germination of the seed of varieties of *Nicotiana tabacum*, J. A. HONIMO (*Bul. Deli Proefstat. Medan*, No. 7 (1916), pp. 1-14).—Having noted a statement by Raciborski (*E. S. R.*, 12, p. 1050) to the effect that tobacco seeds locally tested germinated very poorly, if at all, in darkness, and one by Gassner (*E. S. R.*, 35, p. 222) to the effect that the seeds of *N. tabacum* belong in the group of seeds which are insensible to light, the author has tested many varieties. He has found that while seeds of Deli tobacco kept in darkness can not germinate more than a small percentage, those of some other varieties germinate in darkness as completely as in light (but require a longer time).

The results of tests with 51 samples representing widely separated regions are tabulated. In darkness the types obtained from the Balkans and Asia Minor germinated most quickly of all and gave the highest percentages. The American types gave a low rate (none above 50 per cent) of germination or none at all in darkness. Types from western and central Europe took an intermediate position, except in one case. Only the seeds of *N. quadrivalvis* agreed with the seeds of *N. tabacum* used by Gassner as regards behavior in darkness.

The growth of isolated plant embryos, G. D. BUCKNER and J. H. KASTLE (*Jour. Biol. Chem.*, 29 (1917), No. 2, pp. 209-213).—In experiments attempting to nourish the Lima bean plant with different compounds, it was found that sucrose and other sugars produced growth, while starch and Hopkins' plant-food solution caused no appreciable stimulation. Cotyledons which showed no reducing sugars caused no growth, while those cotyledons with glucose added gave a good growth. Cotyledons of beans that had germinated and contained reducing sugars also supported growth in isolated embryos. It appears that growth is obtainable when glucose or a carbohydrate giving a hexose on hydrolysis is present, but not in the absence of these substances. While the dry bean does not contain the food necessary to the growth of its own embryo, the green cotyledon of a germinated bean contains the food materials necessary for normal growth.

Observations on the chondriome in tulip flowers, A. GUILLERMOND (*Compt. Rend. Acad. Sci. [Paris]*, 164 (1917), No. 10, pp. 407-409).—The author states that he has found the tulip flower to be as well adapted to the study of chondriomes as that of *Iris germanica*, previously utilized for this purpose (*E. S. R.*, 35, p. 333). The tulip flower has been utilized to make very precise observations, which are said to confirm those previously made regarding the elaboration of the xanthophyll pigment.

Characters and alterations in the chondriomes of the epidermal cells of the tulip flower, A. GUILLERMOND (*Compt. Rend. Acad. Sci. [Paris]*, 164 (1917),

No. 16, pp. 603-612).—The author, briefly describing the method and results of a continuation of the study above noted, employing two varieties of *Fallax suscevolens*, states that the mitochondria are the most delicate elements of the cell and the first to manifest cellular degeneration or injury due to osmotic exchanges. The visible alteration consists largely in the transformation of the mitochondria into relatively large vesicles which assume the aspect of vacuoles, giving to the cytoplasm what appears to be an alveolar structure.

The action of oxidase on anthocyanin, I. NAGAI (*Bot. Mag. [Tokyo]*, 31 (1917), No. 363, pp. 65-74, figs. 2).—The author gives a preliminary report on studies in which an actively oxidizing plant juice, as that of the potato tuber or of certain mushrooms, when added to an aqueous extract of anthocyanin, discharged the color of the extract, according to tables and graphs which are given. It completed the change in about one hour in most cases, extracts from some flowers proving to be somewhat more stable. The mode of action of the plant juices appears to be analogous to that of hydrogen peroxid, which also decolorizes plant juices, the rate of discharge being proportional within limits to the concentration of the solution, this fact also furnishing a means of estimating the oxygen value of the plant juices. The decolorizing effects of the enzymes on plant juices are thought to be due to the destruction of the complex anthocyanin molecule and not to any intramolecular changes, since the action is not reversible.

The sugar content of potatoes as related to age and treatment with liquid air, H. I. WATERMAN (*Chem. Weekbl.*, 13 (1916), No. 5, pp. 122-127; *abst. in Jour. Chem. Soc. [London]*, 110 (1916), No. 643, I, p. 359).—It is stated that the conversion of starch into sucrose which occurred when potatoes were dried at 40° C. did not occur if the potatoes were previously immersed in liquid air.

The effect of ringing on the transfer of materials in *Cornus controversa*, S. HIRINO (*Jour. Col. Sci. Imp. Univ. Tokyo*, 33 (1917), Art. 5, pp. 40, pls. 13).—In tests carried out with *C. controversa*, the author found that water conduction was interfered with very slightly by bark ringing, very seriously by bark and wood ringing, but almost not at all by ringing half way around the stem at either depth or by boring into the wood. Abnormal anthocyanin formation occurred in leaves both above and below the injury in trees that had been ringed. The leaves on the parts above the injury faded and fell earlier than those below, especially where the wood also was ringed.

In case of ringed trees vegetation was much delayed and imperfect in its development and somewhat etiolated the following spring. Blooming also was earlier and more abundant and more fruit was produced. Adventitious shoots were abundant below the ring, particularly in cases in which the wound was deep. Callus developed at the cut edges more strongly in the shallow rings. The water content of the leaves decreased after a time, more particularly in those of the lower portions, those of the deeply ringed trees soon dying completely. The twigs above the ring contained larger proportions of both organic and inorganic materials.

In the shallow ringed trees, there was excess of starch, reducing sugar, ether extract, and ash content, while in deeply ringed trees there was an excess of nonreducing sugar, protein, raw fiber, and tannic acid. In the leaves above the shallow rings, starch was in excess and diastase more so, but this excess was less in the trees that had been deeply ringed. Diastase was present in greater degree in leaves containing anthocyanin than in those which were green in case of both shallow ringed and uninjured trees, the leaves with high anthocyanin content containing an excess of reducing sugar. Leaves of ringed trees contained excess of oxidase and of peroxidase as well as of diastase. These differences were not observable in case of trees which had been only half

ringed. *Cryptomeria japonica* and *Prunus mume*, which had been shallowly ringed, were attacked by insects with particular severity above but not at all below the ring.

Recent studies on sectioning and regeneration in plants, L. DANIEL (*Rev. Gén. Bot.*, 20 (1917), No. 339, pp. 65-72, figs. 11).—The author has made further observations (*E. S. R.*, 19, p. 723) on the production of anomalies by sectioning and other forms of injury to growing plants. Decapitation of *Eucalyptus globulus* was followed by the development of the more juvenile form of leaves. Carrot roots which had been sectioned or otherwise injured gave unusual forms which are described.

The cause of the disappearance of coumarin, vanillin, pyridin, and quinolin in the soil, W. J. ROSSINI (*Alabama Sta. Bul.* 195 (1917), pp. 49-61, pls. 3).—Experiments with sandy loam soils, one of neutral reaction and fair fertility and the other of decidedly acid reaction, are reported. A list of cited literature is included.

It was found that "vanillin, coumarin, pyridin, and quinolin when added separately to the soil used at a concentration of approximately 1,000 parts per million of air dry soil produce a great temporary increase in the number of bacteria which will develop on Brown's albumin agar. In the case of vanillin and quinolin it is shown that this increase in numbers is preceded by a decrease. The number of Actinomyces colonies in the soils treated with coumarin, vanillin, and quinolin decreases, reaching a minimum roughly corresponding with the maximum in bacterial numbers.

"Steam sterilizing of the soil used in these experiments produces material toxic to the growth of wheat plants. Soil microorganisms destroy the toxicity of the steamed soil under the conditions of the experiment. The effect on the growth of wheat of vanillin, coumarin, pyridin, and quinolin in sterile soil and in soil which has been sterilized, reinoculated, and incubated was compared. In the inoculated soil the toxicity of the four compounds largely disappears. It persists in the sterile soil.

"Specific bacteria were isolated from the soils used which utilize coumarin, vanillin, and pyridin as food sources. The bacterium feeding on vanillin will in pure culture destroy the toxicity of vanillin [and coumarin] to wheat. . . . The increase in the numbers of bacteria in the soils treated with the four compounds and the disappearance of the toxicity of these substances in inoculated soil is believed to be due to the fact that they serve as favorable food sources to definite species of bacteria."

FIELD CROPS.

[Work with field crops on the Huntley reclamation project experiment farm in 1916], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm*, 1916, pp. 1-10, 12-14, 16-23, figs. 2).—This continues work previously noted (*E. S. R.*, 36, p. 132), together with additional new experiments including methods of establishing irrigated pastures, methods of seeding clover, and crop rotation experiments.

The average yields of all crops in 1916 in the irrigated-crop rotation experiments amounted to 4.64 tons of alfalfa, 11.17 tons for sugar beets, 240.3 bu. for potatoes, 73.2 bu. for oats, 26.4 bu. for wheat, 36.3 bu. for corn, and 17.7 bu. for flax. The maximum oat yield for 1916 amounted to 104.8 bu. per acre and was grown in rotation with alfalfa (2 years) and potatoes. The maximum potato yield, 401.7 bu., followed alfalfa for 3 years. The maximum sugar beet yield, amounting to 17.93 tons, was obtained in a rotation of beets (manured) and potatoes.

Sugar beets grown in rotation yielded 1.59 tons more per acre in 1916 than in 1915, the average percentage of sugar, however, amounting to 18.5 in 1916 as compared with 17.7 in 1915. Beets grown on manured oat stubble land gave an average yield of 12.52 tons per acre, while the average yield after oats without manure was 8.5 tons.

Maximum wheat yields were secured in a 2-year rotation with sugar beets. Wheat grown continuously for 5 years yielded 21.7 bu. per acre as compared with a yield of 24.8 bu. on an adjoining plat where the straw was returned each fall and plowed under.

Maximum corn yields were secured in a 2-year rotation with potatoes and the minimum yield in a 2-year rotation with oats. Flax following alfalfa pastured by hogs in 1914 and corn hogged off in 1915 yielded 27.9 bu. per acre in 1916, while flax grown continuously for 5 years produced 7.5 bu. per acre.

In experiments in establishing irrigated pasturage, three grass mixtures were employed, representing rates of seeding of 21, 17, and 16 lbs. per acre, respectively. Average acre yields were secured amounting to 35 bu. of wheat as a nurse crop cut for grain, 1.93 tons for wheat cut for hay, and 0.85, 0.22, and 0.67 ton of grass hay for mixtures 1, 2, and 3, respectively. It was concluded that good stands of grasses could be obtained with grain seeded as a nurse crop provided proper care is exercised in applying the irrigation water. It is deemed expedient to meet the water requirements of the grasses rather than those of the nurse crop for the best results. Plats seeded in the manner described above in 1915 are said to show comparatively little difference in the growth of the grasses although those seeded without a nurse crop produced slightly more growth early in the season.

Spacing tests with sugar beets were conducted in 1912, 1914, and 1916, the beets being planted in rows 18, 20, and 24 in. apart and thinned to distances of 6, 9, 12, 15, and 18 in. in the row for each row width. The highest yield for 1916 was at the rate of 15.4 tons per acre from the 24-in. rows, with beets thinned to 6 in. in the row. The lowest yield, amounting to 13.26 tons per acre, was secured from 18-in. rows thinned to 15 in. Three-year average yields for the different row widths amounted to 15.31, 15.17, and 16.03 tons per acre for 18-, 20-, and 24-inch rows, respectively. Average yields for plats thinned to 6, 9, 12, 15, and 18 in. regardless of distance between rows amounted to 15.95, 15.06, 15.77, 15.31, and 15.51 tons, respectively. A slight decrease in sugar content appeared to accompany an increase in width of row, distance of thinning, and size of beet produced.

Field tests in sugar beet root-louse control by means of irrigation, similar to more limited experiments conducted in 1915, are reported with results confirmatory of those previously noted (E. S. R., 33, p. 430).

Sugar beets siloed at harvest time showed an average loss in weight on December 1 of 4.4 per cent. Based on 1916 prices for sugar beets it is estimated that the average loss in value amounted to 28.5 cts. per ton, the sugar content remaining practically constant.

Red, white, and alsike clovers were sown on duplicate plats in the spring with wheat as a nurse crop cut for hay, with wheat cut for grain and without a nurse crop, and seeded in late summer in wheat stubble. Red clover produced a good stand with the three methods of spring seeding, while white and alsike clovers produced good stands only without a nurse crop, a stand estimated at about 50 per cent being secured with a nurse crop. All three clovers produced good stands from the late summer seedings. Red clover plats gave an average yield of 1.8 tons of hay per acre and alsike clover a yield of 0.65 ton per acre. The average yield of wheat as a nurse crop cut for grain was 40.6 bu. per acre and of wheat cut for hay 2.03 tons per acre.

Seed production rests with alfalfa including (1) clipping the alfalfa early when about 8 or 10 in. high, leaving the second growth for seed, (2) harvesting the first crop for hay and leaving the second crop for seed, and (3) leaving the first crop for seed, gave average yields amounting to 2.56, 2.39, and 3.44 bu. per acre, respectively.

Svanhals and Smyrna barleys, with yields of 45.5 bu. per acre each, were the leading barley varieties tested in 1916. Marlout was lowest with a yield of 31.1 bu.

In variety tests with corn for the 3-year period of 1914-1916, inclusive, U. S. Selection 133 was highest with an average yield of 48.9 bu. per acre and Minnesota No. 23 lowest with 36.2 bu. Northwestern Dent, with an average yield of 43.4 bu., was the highest of the early-maturing varieties and is held to be the most dependable variety tested. Six varieties tested for silage production in 1916 gave yields varying from 8.68 tons per acre for Northwestern Dent to 14.49 tons for Australian Flint. Although higher yields of silage were secured from late-maturing varieties it was regarded as of rather inferior quality.

Alfalfa grown on plats fertilized with different amounts of acid phosphate each year since 1913 gave an average yield for all plats of 1.55 tons per acre, with no significant difference in yields due to the fertilizer.

[Report of field crops work at the Grand Rapids substation, 1916] (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 10-23, figs. 7*).—This reports the progress of work previously noted (*E. S. R., 37, p. 228*) during 1916. Meteorological data are summarized for 1915 and 1916.

In variety tests with spring wheat for 1915 and 1916 the highest average yield, 19.9 bu. per acre, was obtained from Prelude, with Marquis second with 17.5 bu. In milling tests with 4 varieties of spring wheat, Prelude gave the highest percentage of flour, 72.7, as compared with 68.8 for Marquis, and was also deemed superior in quality to the other varieties tested.

Kherson, with a 2-year average yield of 84.1 bu. per acre, was first among the oat varieties tested; Banner second with 79.5 bu.; and White Russian third with 78.9 bu.

In variety tests with barley the maximum average yield for 1915 and 1916 was obtained from Blue Ribbon and amounted to 39.1 bu. per acre. Odessa, with 38.4, and O. A. C. No. 21, with 38 bu., were second and third, respectively.

Variety tests with winter wheat in 1916 resulted in yields ranging from 10.6 bu. for Bearded Fife to 26.8 bu. per acre for Turkey Russian. Winter injury to wheat varied from 0 for Turkey Red and Egyptian Amber to 29 per cent for Kharkov.

Wisconsin No. 2 winter rye yielded 41.4 bu. per acre with no winterkilling. Time-of-seeding tests with winter rye, with planting dates of September 1, September 15, and October 1, resulted in yields of 31.3, 26.1, and 23 bu. per acre, respectively.

Minnesota No. 13 corn, with a total yield in green weight of 12 tons per acre, was first in the 1916 variety tests and is deemed best for either silage or fodder, and under favorable conditions is said to mature seed. Minnesota No. 23 and early flint corn are recommended for ear corn or for hogging off.

Eight varieties of field peas were tested for hay and grain production in 1916. Green Canada and Wisconsin No. 508 were first in yield of forage, with 2.4 and 2.2 tons of hay per acre, respectively. Wisconsin No. 508, Green No. 208, and Green Canada, with yields of 30.5, 25.8, and 24.6 bu. per acre, respectively, gave the highest yields of seed.

Variety tests with 6 grasses and 6 clovers resulted in maximum yields of 2.5 tons of hay per acre for English bluegrass for the grasses, and of 3.3 tons for Mammoth clover for the clovers. English and Italian rye grasses, with yields

of only 0.58 and 0.75 ton per acre respectively, winterkilled, while sweet clover, sainfoin, and Bokhara clover are reported as producing poor stands and being very weedy.

Tests with different-sized seed pieces of potatoes resulted in yields per acre of 336.1 bu. for whole tubers, 272.7 bu. for half-tubers, 232.7 bu. for quarter-tubers, and 258.9 bu. for the ordinary cut, with percentages of marketable tubers amounting to 86.9, 88, 88.4, and 86.7, respectively. Fifty-three varieties of potatoes were tested, with yields varying from 8 bu. per acre for Early Market, to 428 bu. for Peach Blow. British Queen and Green Mountain, with yields of 412.4 and 411.5 bu., were second and third, respectively. Green Mountain was highest in the percentage of marketable tubers, with 95.4 per cent.

In the alfalfa experiments the average of all varieties inoculated with soil and grown without a nurse crop was 4,600 lbs. of cured hay per acre as compared with 3,133.3 lbs. with barley as a nurse crop. In another test the average yields were 5,120 and 3,520 lbs., respectively. The total average yield of all varieties tested was 5,776.4 lbs. of cured hay per acre. N. W. Experiment Station, which is thought to be a strain of Minnesota Grimm, gave the highest total yield of hay, 7,188.1 lbs. per acre, followed by Grimm with 7,104 lbs.

[Field crops], R. H. CLEMENS (*Rpt. Montielth Demon. Farm, 1916, pp. 8-21, figs. 10*).—Field work on the Montielth Demonstration Farm in Ontario with winter and spring wheat, barley, peas, flax, oats, clover and grass seed, alfalfa, turnips, and potatoes for 1916 is reported. Satisfactory results were obtained with feeding silage made from a mixture of oats, peas, and vetches.

[Field experiments in 1916], H. VON FEILITZEN (*Swenska Mosskulturför. Tidskr., 31 (1917), No. 3, pp. 246-260*).—The experiments reported were conducted by the Swedish Moor Culture Association on 20 experiment fields and 26 demonstration fields on moor soils. The results are summarized as a whole.

The use of lime, even on peaty soils in which the lime content was nearly adequate, produced good effects mainly, it is thought, through a promotion of nitrate formation. The application of increasing quantities of phosphoric acid and potash on soiling crops and grass gave varying results in different localities. At Kristineberg the best yield of green forage was secured from the use per hectare of 300 kg. of superphosphate and 250 kg. of 37 per cent potash salt. On meadows the best results were secured at Tobo with 300 kg. of Thomas slag, at Lundås with 200 kg. of superphosphate and 100 kg. of 37 per cent potash salt, and at Tärne with 200 kg. each of superphosphate and 37 per cent potash salt.

Applications of nitrate of soda on a fairly good peat soil increased the yield of spring rye grown for soiling purposes, but on the best soils of this type the use of nitrate did not prove profitable. Barnyard manure in general gave good results. In one locality its residual effect the third year after application was not very apparent. The value of the manure in these tests, based on the results, was 88öre per 100 kg. (about 10 cts. per 100 lbs.). Annual fertilization of the soil was found necessary to obtain good yields of the different moorland crops, and the addition of commercial fertilizers to barnyard manure in general gave profitable returns.

Results obtained with oats, barley, root crops, and grass are also briefly noted.

[Report of field crop work], W. J. COLLEATCH and R. O. SCOTT (*Jour. Dept. Agr. So. Aust., 20 (1916), Nos. 3, pp. 175-195; 4, pp. 256-276; 5, pp. 344-359; 20 (1917), No. 6, pp. 464-479*).—Tillage, manurial, and rotational experiments conducted on the permanent experimental fields of the Roseworthy Agricultural College since 1904 are outlined and the results through 1915 reported. Detailed tabular data are presented and discussed.

The tillage experiments included depth-of-plowing tests and a comparison of early and late fallows. The deeply-plowed (7 in.) winter fallow, adequately cultivated to keep down the weeds and check loss of moisture through evaporation, has been the most remunerative system tested.

The fertilizer experiments included tests with phosphates, commercial nitrogenous materials, potash, farmyard manure, and lime. The phosphate tests were extensive and included the testing of various phosphorus carriers and of phosphate applications under various cropping conditions. The results of all fertilizer tests are summarized in tabular form, showing the direct effects of the various treatments on wheat when harvested for grain or hay, as indicated by the net values of the mean yields. In the bare-fallow, wheat rotation an application of 2 cwt. of acid phosphate gave the highest net return with both grain and hay, the value of the mean yields being \$2.87 and \$2.87 per acre, respectively, in excess of the value of the mean yields produced on the untreated checks. In the bare-fallow, wheat, pasture rotation an application of 0.5 cwt. of acid phosphate gave the highest net return for wheat, \$4.68, while the highest return for hay was \$5.28 from an application of 1 cwt.

The rotation experiments included 2-, 3-, 4-, and 5-course rotations with wheat, sorghum, rape (for pasture), barley, peas, and alfalfa. The highest net return per acre from the various systems tested was secured from a bare-fallow, wheat, barley rotation when based on the value of the wheat crop harvested either for grain or for hay.

Harvest report [Roseworthy Agricultural College], 1916-17, W. J. COLMACH ET AL. (*Jour. Dept. Agr. So. Aust.*, 20 (1917), No. 8, pp. 623-648).—Considerable meteorological and crop data for the season 1916-17 are reported. The crop yields totaled 165 tons of berseem clover, 103 tons of cereal silage, 375 tons of hay, 200 tons of straw, and 10,786 bu. of grain, including peas, barley, oats, rye, and wheat.

Additional data show the comparative yields of wheat varieties, hybrids, and selections grown on the college farm in 1916.

Culture experiments with varieties of root crops, P. J. LÖVÖ (*Aarsber. Norges Landbr. Høiskoles Akervekstforsøk*, 27 (1915-16), pp. 10-57, figs. 4).—The results of cooperative culture and variety tests with root crops in different parts of Norway are reported.

It was found that root crops over the entire country produced yields of forage higher than those secured from any of the crops generally grown for that purpose. In most sections the best yields of forage were secured from turnips. It was also found that the turnip crop is capable of utilizing a heavier application of fertilizers, as well as better methods of culture, than are now generally given. Of the different varieties grown Dales Hybrid showed the best keeping qualities. The relative production of foliage was higher in northern Norway than in other parts of the country.

Experiments with different kinds and mixtures of hay crops, K. VIK (*Aarsber. Norges Landbr. Høiskoles Akervekstforsøk*, 27 (1915-16), pp. 58-115).—Hay crops were tested in 3- and 5-year rotations.

Among the leguminous hay crops in both rotations red clover followed by alsike clover led in production. Timothy stood first among the grasses in both rotations, but a strain of English rye grass gave nearly as good yields in the 3-year rotations and several strains of fescue grasses in the 5-year rotations. In a series of 5-year tests grass mixtures gave in every case a greater yield than was secured from the same grasses grown separately. The standard mixture, consisting of 20 per cent red clover, 10 per cent alsike clover, and 70 per cent timothy, in most instances gave the best yield.

Pastures on peat soils, H. von FILLITZEN (*Om Betesvallar på Torvjord. Göteborg, Sweden: Göteborg Lithographing Co., 1917, pp. 22, figs. 59*).—The discussion presented is based largely on the results obtained on the experiment fields of the Swedish Moor Culture Association. The subjects considered include the adaptability of peat soils to pastures, the kind of peat soils best suited for the purpose, methods of establishing pastures on such soils, the maintenance of the pastures to give satisfactory results for a series of years, conditions in long and recently established pastures on mossy soils and on peat soils high in nitrogen content, and the use of pastures for the production of hay.

The 1918 grain crop, T. F. HUNT (*California Sta. Circ. 169 (1917), pp. 8*).—The author briefly discusses the advisability of employing a portion of the barley acreage in California for wheat production during the present emergency, and outlines other possible means of increasing the wheat yield as (1) increased acreage through the utilization of new land, and (2) increased production on the existing acreage through improved farming methods.

The effect of different methods of inoculation on the yield and protein content of alfalfa and sweet clover, II, A. C. ARNY and R. W. THATCHER (*Jour. Amer. Soc. Agron., 9 (1917), No. 3, pp. 127-137; abs. in Physiol. Abs., 2 (1917), No. 6, p. 375*).—This paper, continuing inoculation studies (E. S. R., 33, p. 633), reports the results secured with the 1915 crop and presents the conclusions drawn and the data obtained.

Inoculation at seeding time produced a large increase in yield of dry matter per acre and in percentage of protein in the dry matter in the second season thereafter (first harvestable crop) as compared with the yield and composition of the crop from adjacent uninoculated plots. In the next season's growth (second harvestable crop) the differences are much less noticeable, and practically disappear the following year because of the rapid spread of the inoculating bacteria to the uninoculated plots. Inoculation of either alfalfa or sweet clover with soil from either alfalfa or sweet clover fields was equally efficient in producing these effects. Inoculation with soil was generally more efficient in these respects than inoculation with the commercial cultures used in the experiments. Liming at seeding time (2 tons ground limestone per acre) slightly intensified the above-mentioned effects of inoculation. Inoculation produced an increased capacity of the plants to utilize mineral soil nutrients, the increased growth resulting in the removal from the soil of very much larger amounts of potassium, phosphorus, and calcium. Inoculated plants were also enabled to elaborate a somewhat larger amount of dry matter from a given amount of mineral plant-food element.

Barley in Wyoming, T. S. PARSONS (*Wyoming Sta. Bul. 115 (1917), pp. 11-35, figs. 2*).—This reports experimental work for the 5-year period 1911-1915.

Hanna and White Hull-less, the only varieties grown for 5 years, gave average yields of 41.4 and 40.3 bu. per acre, respectively. California Feed and Chevalier, with 4-year average yields of 60.9 and 58.1 bu., and Success, with a yield of 62 bu. per acre for one year, were the leading varieties reported.

At the station barley required a growing period of from 106 to 122 days. With early plowing and good seed-bed preparation it showed little difference in yield on spring or fall plowed land. Good soil preparation was deemed more advantageous than very early seeding. The 2-year average yield of all home-grown seed at the station was 54.1 bu. per acre as compared with a yield of 50.6 bu. for imported seed. Barnyard manure is reported as giving good results with barley, with a marked cumulative effect. Idaho, Utah, and Colorado winter barleys tested at the Wyoming Station winterkilled, although successful yields of winter barley have been reported from Platte County.

Approved methods of barley production are briefly outlined.

Corn planting and cultivation in Montana. A. ATKINSON and M. L. WILSON (*Montana Sta. Circ.* 67 (1917), pp. 107-123, figs. 29).—The preparation of the seed bed, time and method of planting, and the cultivation of corn are discussed in some detail and types of corn planters and cultivators illustrated.

[**Cotton in Brazil**] (*Primeira Conferencia Algodoeira. Rio de Janeiro: Soc. Nac. Agr.*, 1916, pp. 18; *Lavoura*; *Bol. Soc. Nac. Agr. [Brasil]*, 20 (1916), No. 7, pp. 53-81).—This is a report of the proceedings of the First Cotton Conference of Brazil and includes a classification of the commercial types of cotton in Rio de Janeiro.

How to increase the potato crop by spraying. F. H. CHITTENDEN and W. A. OSTON (*U. S. Dept. Agr., Farmers' Bul.* 868 (1917), pp. 22, figs. 23).—This outlines approved methods of control of the Colorado potato beetle, blister beetles, flea-beetles, cutworms and caterpillars, leafhoppers, aphids, late and early blight, and other foliage diseases. Directions for preparing and applying sprays are given and spraying appliances noted. Other methods of control are also briefly described.

The effect of growing radishes on the succeeding maize crop. H. E. ANNETT (*Agr. Jour. India*, 12 (1917), No. 1, pp. 151, 152).—Observations of marked deterioration in the corn crop grown on that portion of a field which had produced radishes during the cold weather are briefly noted. Analyses of surface soil and subsoil as to available phosphoric acid and potash did not show sufficient differences to explain the depression.

Eight years' experiments with new varieties of oats. K. VIK (*Aaraber. Norges Landbr. Høiskoles Akervekstforsøk*, 27 (1915-16), pp. 115-134).—The results of experiments in progress from 1909 to 1916, inclusive, with 29 varieties of oats, including many of the newer sorts, on 71 fields in different parts of the country are reported.

The highest average yield of grain, about 70 bu. per acre, was secured from Klokke II, a cross between Guldregn and Klokke. Stormogul, which stood first in straw production with 4,462 lbs. per acre, also ranked high in the yield of grain. Guldregn, followed closely by Tartar King, ranked first in weight per bushel, with 41.4 lbs., and last in hull content, with 23.6 per cent. A brief description of the performance of each variety is given.

Ragi. L. C. COLEMAN (*Mysore Agr. Calendar*, 1917, pp. 42-46).—Manurial, cultural, and seed-selection tests with ragi (*Eleusine coracana*), the staple food crop of Mysore, are briefly noted. Green manuring with sunn hemp has given larger and cheaper returns than fertilizing with cattle manure. Fall plowing or early spring plowing is deemed essential to successful production.

Sugar-cane experiments for the season 1914 to 1916. J. R. BOVELL and J. P. v'ALBUQUERQUE (*Barbados Dept. Agr., Rpt. Sugar-Cane Expts., 1914-1916*, pp. 80).—Fertilizer and variety tests with sugar cane are reported in continuation of work previously noted (*E. S. R.*, 32, p. 331).

Sulphate of ammonia again gave the highest net return of the nitrogenous fertilizers, \$90.58 per acre. In the phosphate series, a net gain of \$110.88 was obtained from an application of 100 lbs. of basic slag, and in the potash series, 100 lbs. of potash as sulphate was highest with \$94.92. The difference between the highest and lowest yielding plots for the period was 42.2 per cent.

The testing of seedling and other canes was continued as heretofore with White Transparent as the standard variety for comparison. The average yield of this variety in the black soil district, from 19 plots, was 6,610 lbs. of muscovado sugar per acre. The highest yielding seedling variety was B. 4578, with 10,531 lbs. for one plot, representing a monetary gain of \$141.55 per acre over White Transparent.

On the red soils, the average yield of White Transparent was 5,814 lbs. per acre. The seedling cane B. 6450 gave the highest yield, 8,798 lbs., representing a monetary gain over the standard of \$107.58 per acre.

For the period of 1912 to 1916 White Transparent gave an average yield of 4,920 lbs. on the black soils and 5,321 lbs. per acre on the red soils. The highest yielding variety for the five-year period was Ba. 6032, with a yield of 7,728 lbs. and a monetary gain over White Transparent of \$87.67 per acre. B. 6450 gave the highest average yield on the red soils, 7,791 lbs., with a monetary increase over White Transparent of \$59.53 per acre. This variety also gave an increase of \$35.72 over the standard variety on the black soils.

In a comparison of Ba. 6032 and B. 6450 on 34 plats, Ba. 6032 gave, as a three-year average, 1,429 lbs. of saccharose per acre more than B. 6450.

Notes on improved methods of cane cultivation, C. OLARKE and N. HUSAIN (Dept. Land Rec. and Agr. United Prov. Agra and Oudh, *Bul. 35* (1916), pp. 8, figs. 3; rev. in *Agr. Jour. India*, 12 (1917), No. 1, pp. 170-172).—Improved and tested varieties of sugar cane are recommended for the Central Provinces and cultural practices deemed best for the region outlined.

Distribution of cane for seed, H. B. COWGILL (*Porto Rico Bd. Agr. Expt. Sta. Circ. 8* (1917), Spanish Ed., pp. 3-13).—Local and introduced varieties of sugar cane are briefly described and the advantages of the development of new varieties outlined. Regulations governing the distribution of cane for seeding purposes are noted.

Sweet clover, A. ATKINSON (*Montana Sta. Circ. 62* (1917), pp. 49-55).—The production of sweet clover in Montana for hay and pasture is discussed and the handling of the crop for seed production noted.

Sweet clover grown under irrigation in 1915 yielded 2.2 tons for the white-flowered biennial, 2.67 tons for the yellow-flowered biennial, and 0.62 ton for the small yellow-flowered annual. In 1916 the first two sorts yielded 3.02 and 4.2 tons per acre, respectively, the annual sweet clover being entirely winter-killed. The white and yellow flowered biennials grown on dry land at the Judith Basin substation in 1916 yielded 1.18 and 1.32 tons of hay per acre, respectively.

Harvesting and storing sweet potatoes, J. C. PRICE (*Alabama Col. Sta. Bul. 197* (1917), pp. 87-103, pls. 4, figs. 4; pop. ed., pp. 87-100, pls. 4, figs. 2).—The results of storage tests with sweet potatoes conducted at Auburn and at other points in cooperation with growers are reported for 1914-1916, inclusive, for a comparison of the keeping qualities of potatoes stored in an especially constructed storage house and those stored in banks, pits, or trenches. Approved methods of harvesting, curing, and storing the crop are described. The curing temperatures varied from 80 to 85° F. and the storage temperatures from 50 to 60°, the extreme limits for storage being from 40 to 65°. Humidity varied from 80 to 90°. Temperature and humidity records were secured during the curing and storage period for each year of the experiment and are shown by graphs.

The Triumph, Nancy Hall, and Porto Rico, deemed the most important commercial varieties grown in the State, are reported on in the storage tests and show a loss by decay in the house of from 1.5 to 11 per cent on March 1 as compared with a similar loss of from 7.5 to 100 per cent in the banks on the same date.

A selected sample of Triumph potatoes weighing 120 lbs. was placed in storage Nov. 10, 1915, and observed for loss in weight. A loss of 5.5 lbs. was sustained the first 5 days at an average temperature of 84°, while during the next 5 days under an average temperature of 62° there was an additional loss

only 2.22 lbs. A total loss of 29.9 lbs. was noted at the end of the experiment, Mar. 12, 1916.

It is concluded that sweet potatoes can be sufficiently cured in from 10 to 14 days and that cured potatoes stored in a dry room are far superior to potatoes stored in banks in quality, condition, and freedom from decay, and that they are to be preferred for bedding purposes.

Plans and specifications are submitted for a storage house 20 by 20 ft. with a 1,250-bu. capacity.

Field experiments with tobacco, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 19 (1915), pp. 44, pl. 1*).—This is a general outline of (1) the methods employed, and (2) the investigations in progress in field experiments with tobacco in the Dutch East Indies.

Expectations from the F_2 generations of tobacco, A. D'ANOREMOND (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 23 (1916), pp. 45-65*).—This is a general discussion of the expectations in the F_1 and F_2 generations of tobacco hybrids, based on Mendelian dominance and segregation of characters.

A new seeding device, J. T. BAUMOARTEN (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 23 (1916), pp. 81-83, pl. 1*).—A device for seeding tobacco seed beds is briefly described and illustrated.

Fertilizing the seed beds, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 4 (1913), pp. 27, pls. 2*).—Fertilizer experiments at eight centers to determine the best treatment for tobacco seed beds are reported.

The results in all but two cases indicated that an application of 100 gm. of ammonium sulphate, 100 gm. of acid phosphate, and 25 gm. of potassium sulphate per seed bed of 10 by 8 ft. gave the best results. On the poor, sandy soil of one center an application of 100 gm. of ammonium sulphate, 200 gm. of acid phosphate, and 50 gm. of potassium sulphate gave the best results, while on the wet, sandy soil of another center 100 gm. of ammonium sulphate and either 100 or 200 gm. of acid phosphate proved to be best.

[Report of fertilizer experiments with tobacco, 1910-1916], O. DE VRIES and E. SMITRUE (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. (1915), pp. 82; 9 (1914), pp. 42; 15 (1915), pp. 64, pl. 1; 18 (1915), pp. 31-3; 20 (1915), pp. 33-67; 26 (1916), pp. 28*).—Fertilizer experiments conducted at numerous centers in the Dutch East Indies are reported for each year. These tests were planned primarily to study the effect of chemical fertilizers upon the relative chemical composition of the lower, middle, and upper leaves of the tobacco plant, together with the effects on yield and quality.

The highest yields have been obtained from the use of ammonium sulphate, although the senior author does not recommend its use on good soil. The estimated average increase of fertilized fields for 1910-1914 was 10 per cent.

The experiments were considerably reduced in 1915-16, but gave practically the same results as noted above. With applications of 6, 10, and 16 gm. of ammonium sulphate per plant the increases were 17.8, 15.3, and 21.4 per cent, respectively.

Green manuring tests, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 20 (1915), pp. 4-19, pl. 1*).—Tests during 1913 and 1914 with *Cassia alba*, *Desmodium stipulaceum*, *Mucuna*, *Phaseolus lunatus*, and *P. radiatus* as green manures for tobacco are reported and briefly discussed. Agronomic data are presented in tabular form for each crop and for each year of the experiment. The first three crops named gave the best average results, based on tobacco yields.

Harvesting experiments with tobacco, 1912-13, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 8 (1914), pp. 43*).—The author reports experiments with early and late harvesting, harvesting of individual

leaves (priming), stripping the leaves, and cutting the entire plant, including a study of the influence of the various practices upon the color, quality, and weight of the product.

The results indicated that early-harvested leaves were brighter in color and superior in quality, though practically the same in weight, as those harvested later. When harvesting the leaves individually considerable variation was observed, resulting in a product lacking in uniformity. Cutting the entire plant produced a browner, brighter, drier, less hygroscopic tobacco which had less tendency to mold than that harvested by stripping. The leaf weight in the former method was about 10 per cent less than in the latter, but the total weight was practically the same owing to the fact that the smaller leaves were included in the harvest. It is recommended that for general practice the crop be harvested by stripping in dry years and by cutting in wet years.

Tobacco curing tests, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 25 (1916), pp. 80, pls. 3*).—Extensive tests in curing tobacco are reported and the following general conclusions drawn from the results:

During the first stage, which is designated as the time occupied in changing from green to brown, requiring from 7 to 10 days, the tobacco is very sensitive to variations in temperature. The tests varied between 26 and 30° C. a 2 to 3° difference in temperature giving an entirely different curing. The relative humidity of the air was also of importance, but might vary to a greater extent than temperature (60 to 95 per cent or higher). Ventilation had little influence on the first stages.

Rapid curing resulted in tobacco of high value, possessing bright color and excellent handling qualities, while, on the other hand, rapid curing increased the hygroscopicity of the tobacco to such an extent as to frequently result in pressure spots during subsequent fermentation which offset the good effects noted above. Gradual curing, lasting two or three days longer, had the disadvantage of favoring rotting and other undesirable conditions not met with in rapid curing.

The second phase of curing is designated as the passing from the brown stage to the dry. The quality of the tobacco was about equal with either rapid or gradual drying.

Artificial drying or drying under control conditions proved to be of the greatest value in improving the quality and color of the product.

Prefermentation in special stacks of tobacco, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 23 (1916), pp. 69-88; also in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 8, pp. 1118, 1119; Bol. Tec. Cultiv. Tabacchi [Scafati], 15 (1916), No. 3-6, pp. 34, 95*).—Owing to the extreme dryness of the tobacco-growing season of 1914 in Java the tobacco harvested at that time showed traces of pressure undergone after fermentation, these traces remaining visible in the form of streaks and spots on the leaves and considerably reducing the value of the product. In an attempt to remedy this fermentation stacks were designed having an open center in which the air could circulate more freely than in the ordinary form of stack.

Provided the temperature of these stacks did not exceed 85° C. (185° F.), the results were very satisfactory. In subjecting tobacco thus treated to the usual fermentation processes hardly any trace of pressure was observed. The conclusion is that a slow oxidation occurs in the preliminary stacks, destroying certain essential oils which are decomposed by the heat, which frequently reaches 54° in the ordinary stacks. The products of this decomposition are then thought to impregnate the dry cells, forming pressure spots on the leaves.

Tobacco fermentation experiments, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 21 (1915), pp. 42, pl. 1*).—This reports experiments with piles of fermenting tobacco to determine (1) the absorption of air by the piles, (2) the heat insulation of the piles, (3) heat distribution in the piles, and (4) the overheating of tobacco in piles. The report covers the period of 1910 to 1915 and consists somewhat of a compilation of the results of other investigators supplemented by the author's own work. No definite conclusions are drawn, although rather comparable results were obtained. An ingenious device is described and illustrated for measuring heat insulation.

Tobacco fermentation tests, N. H. COHEN and H. JENSEN (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 12 (1912), pp. 38, fig. 1*).—Studies of the phenomenon of tobacco fermentation are reported in an effort to determine the rôle of bacteria and enzymes and the chemical changes occurring in the process.

Fermentation was produced at a temperature of 60° C. (140° F.) with a relative humidity of from 80 to 90 per cent. The process is reported as being in no sense bacteriological. Unsatisfactory moisture conditions occasioned a reddish tinge in the tobacco. Together with humidity, temperature exerts an influence on color, high humidity and high temperature resulting in darker color. Mechanical pressure alone had probably no material influence upon color, although a higher percentage of light-colored leaves was observed in the smaller piles. Whether this was due to better ventilation or to decreased pressure was not clear.

Similar results are reported by Jensen in experiments conducted by him independent of those described above.

Observations on the combustion of tobacco, N. H. COHEN (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 3 (1913), pp. 29, fig. 1*).—This paper is presented in three parts, as follows: (1) Methods for determining combustion of tobacco, (2) the influence of the degree of maturity upon combustion, and (3) the influence of the potash content upon combustion.

For the purpose of comparing strains of tobacco, the author recommends the use of the formula: $Br = \frac{G}{t\sqrt{g}}$, when Br. is the coefficient of combustion, G the weight of the ash, g the initial weight of the sample, and t the time of combustion. Considerable tabulated data are presented and discussed in illustrating the use of the formula.

Samples representative of four degrees of maturity, (1) unripe, without any indication of maturity, (2) ripe, but with yellow tinge, (3) fully matured, and (4) overripe, were analyzed. The conclusion is reached that tobacco should be entirely ripe before harvesting.

After briefly reviewing the results of other investigators the author concludes that it is still an open question as to whether a sufficient weight of potash could be supplied by any practical system of fertilization to improve combustion materially.

Observations on the combustion of tobacco, O. DE VRIES (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 22 (1916), pp. 5-23, pl. 1; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 8, p. 1119*).—The author briefly reviews the observations of Tymstra, Cohen, and others on the combustibility of tobacco and defines the phenomenon as the time occupied in the combustion of a leaf of tobacco stretched horizontally and ignited near its central part. Observations are also reported and illustrated on the color of the ash of small "cigars" made from tobacco of the same origin and

allowed to burn themselves out, a scale of colors facilitating an estimate of the differences.

Reports of fertilizer tests with ammonium sulphate, potassium nitrate, sodium nitrate, and phosphoric acid are held to indicate that fertilizer treatments have no influence on combustibility.

Observations on the combustion of different strains of tobacco produced in Semampir and Mlissen, A. D'ANCKERMANN (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 24 (1916), pp. 27-39*).—This reports observations on 133 strains of tobacco, giving the average combustibility in seconds and indicating the best strains and hybrids for these localities from the standpoint of combustion.

Comparison of varieties of turnips on 101 experiment fields from 1906 to 1915, P. KAOSAR (*Aarsber. Norges. Landbr. Høiskoles Akervekstforsøk, 27 (1915-16), pp. 134-142*).—The results are tabulated and summarized, showing that of the four principal varietal groups the flat-topped turnips included the largest number of valuable varieties and gave the highest average yield of dry matter in the roots, approximately 4,540 lbs. per acre. The Yellow Long varieties produced about 4,373 lbs., and the White Globe and Yellow Globe varieties approximately 3,955 and 3,855 lbs. per acre, respectively. The different groups and varieties varied in dry matter production in different sections of the country. Leaf production also varied with the group and with varieties in the group in the various localities. The performance and behavior of the varietal groups, as well as of the individual varieties, are briefly discussed.

Wheat culture, J. W. GILMORE (*California Sta. Circ. 172 (1917), pp. 8*).—Factors involved in wheat production in California are briefly reviewed, emphasizing the importance of seed-bed preparation, maintenance of organic matter in the soil, the use of good seed, the time and method of seeding and amount of seed required, fertilization, and irrigation.

The conversion of the weights of mechanical separations of corn, wheat, and other grains into percentages, E. G. BOEHRER (*U. S. Dept. Agr. Bul. 574 (1917), pp. 21, figs. 2*).—Tables are given and described for the conversion of weights of mechanical separations into percentages for corn (E. S. R., 36, p. 836), wheat, and other grains.

Percentage equivalents are given for separations of wheat weighing from 0.1 to 20 gm. taken from samples weighing from 25 to 65 gm., inclusive, and covering the entire range of maximum and minimum limits of color, wheat of other classes, damaged kernels, and inseparable impurities, and for separations of corn weighing from 0.1 to 40 gm. taken from samples weighing from 240 to 260 gm., inclusive, and covering the entire range of maximum limits of corn of other colors, damage, heat damage, and foreign material and cracked corn as specified in the numerical grades of the United States standards for wheat and shelled corn. The sampling device previously described (E. S. R., 33, p. 836) is also noted.

The Colorado seed act, W. W. ROBBINS and G. E. ECKINGTON (*Colorado Sta. Seed Lab. Bul. 1 (1917), No. 1, pp. 3-15, fig. 1*).—This bulletin discusses the provisions of the Colorado seed act of 1917. The text of the act is included.

Spraying for the control of wild morning glory within the fog belt, G. P. GARY (*California Sta. Circ. 168 (1917), pp. 7*).—This forms a preliminary report on the use of arsenical sprays as an herbicide in the control of the wild morning glory in the coast regions of California. A stock solution composed of 10 lbs. of granulated caustic soda (98 per cent), 20 lbs. of white arsenic (arsenic trioxide 99 per cent), and water to make 5 gal. is to be diluted at the rate of 1 gal. of the solution to 100 gal. of water. Damp, cloudy, or foggy weather in October is deemed the best time to spray, a luxuriant growth of

mature vines being favorable to the most complete destruction of the roots. The preparation and application of the spray is described and the possible dangers to plant and animal life to be encountered in handling arsenic, briefly noted.

It is stated that from 85 to 90 per cent of the morning glory roots on plats near the coast can be killed to a depth of 4 ft. or more by the application of a properly timed spray to mature vines, and that the vines may be destroyed and prevented from seedling by the use of a spray at any time during the year. While the enfeebled roots of sprayed plants send up new sprouts which reach the surface in from 7 to 12 months, it is thought that annual fall spraying would eventually eradicate the weed.

Farm weeds of North Carolina and methods for their control, J. L. BURGESS and C. H. WARREN (Bul. N. C. Dept. Agr., 37 (1916), No. 8, pp. 20, figs. 17).—This is a brief discussion of the methods of eradication and control of 17 of the principal weeds found in North Carolina.

Weeds in meadows at the Letensuo experiment station, E. F. SIMOLA (Finika Mosikulturför. Årsbok., 20 (1916), No. 2, pp. 92-124).—The results of culture and fertilizer experiments with special reference to weed growth on meadows established on different types of soil are reported.

It was found that the use of the harrow and the application of potash and phosphoric acid reduced weed growth and improved the quality of the hay. Through adequate and suitable top-dressings of swampy meadows such a dense and otherwise favorable growth of grass was secured that after seven years of treatment the meadows were nearly free from weeds. Inadequate applications of fertilizers resulted in thin and weak stands of grass and a high percentage of weeds.

Annual weeds which were quite numerous on fallow almost entirely disappeared and the biennial and perennial species were reduced to a considerable extent during the first year of treatment. The reduction of the species other than annuals varied with the kind of fertilizer application given.

On a clay soil originally largely overgrown with sphagnum the degree of weediness, owing to an increasing growth of *Rumex acetosella* and species of *Agrostis* which crowded out the clovers, was lower during the first year of the experiments than during the fifth. Of the grasses introduced into the meadows, timothy and orchard grass proved most effective and resistant. On this type of soil the grass was mixed with weeds to a less extent than on the soils of a nonclayey character.

Applications of calcium nitrate on other than clay soils gave a larger increase in the yield of hay and a greater improvement in quality than were secured from the use of ammonium sulphate. It was observed that by the fifth year of the tests the introduced grasses had died out and had been replaced mainly by *R. acetosella* and species of *Agrostis*. The larger applications of calcium nitrate produced the smaller quantities of weeds and the higher yields of grass.

Good yields of grass and hay with low weed content were secured on sphagnum bog soils when proper cultivation was given and a suitable grass mixture was used. In an experiment with calcium nitrate, the check plat contained only 1.82 per cent of weeds and yet the weed percentage was smaller on the treated plats. The yields of hay for the different years ranged from 1,953 to 6,213 lbs. per acre. *Lathyrus pratensis* and *Vicia cracca* grew well on this soil without the application of calcium nitrate and proved effective in counteracting the spread of weeds.

A new weed, H. W. ANDREW (Jour. Dept. Agr. So. Aust., 20 (1917), No. 7, pp. 557, 558, fig. 1).—The appearance of *Scorzonera laciniata* (*Podospermum laciniatum*) in South Australia is reported. The plant is briefly described.

HORTICULTURE.

Horticultural statutes of the State of California (*Sacramento, Cal.: State, 1917, pp. 141, pl. 1*).—This booklet contains the text of the various California statutes and quarantine orders relating to horticulture, corrected to August 1, 1917. A list of State and county horticultural officers is included.

[Variety tests of vegetables and fruits] (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 45-57, figs. 4*).—The relative yields are given of varieties of vegetables being tested, together with data on the condition of fruit varieties planted in the new orchard. Varieties of small fruits under observation are also listed. As a result of the vegetable tests the varieties are arranged in order based both on quality and yield.

Celery storage experiments, H. C. THOMPSON (*U. S. Dept. Agr. Bul. 579 (1917), pp. 26, figs. 10*).—Experiments conducted by the author during the four seasons 1912-13 to 1915-16 and here described in detail indicate that it would be advantageous to cut down the standard celery crate, which approximates 24 in. in width and length, to at least 14 in. in width, thereby reducing the amount of decay in storage and the amount of injury to celery from broken crates. Actual tests show that celery in small crates sold for a much higher price than similar celery in standard crates handled in exactly the same way.

Observations made in the cold storage houses showed a much larger proportion of decay for celery in the top tier of the crates at the end of the storage period than in the lower tiers. The variation in keeping quality of celery in the different tiers was greater where the standard crate was used than where smaller crates were used. As a general rule both air temperature and celery temperature increased with the distance above the floor of the storage house. In many instances when the thermometers registered 32° F. within 4 ft. of the floor the temperature was 35 to 36° near the ceiling. The author is of the opinion that thermometers should be placed at various heights in the storage room and in the corners as well as in the passageways. Where there is much variation in temperature in different parts of the room the air should be set in motion.

Improving Grand Rapids lettuce, S. N. GREEN (*Mo. Bul. Ohio Sta., 2 (1917), No. 9, pp. 308-312, figs. 3*).—The author discusses the history and characteristics of the open-headed variety of lettuce, Grand Rapids, and briefly reviews the station's work in improving the variety.

Continued selection has resulted in two improved strains, one of which, the Ohio Grand Rapids, is noteworthy for its increased weight and increased seed production as compared with commercial strains.

Some suggestions are given relative to methods of producing lettuce seed.

Fresh tomatoes and tomato conserves, S. MONDINI (*Bul. Uffe. Assoc. Ori. Prof. Ital., 5 (1917), No. 10-11, pp. 154-158*).—A statistical summary of the tomato and tomato product industry in Italy, including data on the export trade from 1913 to 1916.

[Fruits and ornamentals on the Huntley reclamation project], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 23, 24, fig. 1*).—Notes are given on the condition with reference to hardness of a number of varieties of fruit trees, ornamental trees, and shrubs being tested on the project, including a list of varieties of apples and ornamentals that appeared to be suited to the conditions.

Fruit growing in the Federal District, A. CAIRE (*Bot. Mig. Agr., Indus. e Com. [Brazil], 5 (1916), No. 3, pp. 49-69*).—Notes are given on kinds of fruit grown and those adapted for culture in the Federal District, Brazil.

Pruning apple trees. J. B. KELL (*Mo. Bul. Ohio Sta., 2 (1917), No. 9, pp. 304-307, fig. 1*).—In the spring of 1912 following the regular pruning of the station's variety test orchard a number of trees there in the nineteenth year from planting were selected for a test of the following materials used as wound dressings: Asphaltum-linseed oil, Hoyt's tree varnish, white lead and oil, a combination of these preparations, and asphaltum varnolene. Trees were selected wherever possible with 10 wounds of an inch or more in diameter.

The general effect of all the dressings used was to retard the healing process. The freedom from disease of the untreated wounds used as checks indicated that no dressing was needed. At the end of three years many wounds of 1.25 in. or less in diameter had healed over completely. The rate of healing was greatest in wounds made on the trunk and main branches and least in wounds made by cutting off tops or ends of branches. Wounds made in the early part of the growing season tend to heal more rapidly than those made while the trees are dormant.

It is pointed out that the use of fungicidal sprays against fruit and tree diseases would tend to obviate further the need for wound dressings, except in special cases such as wounds made for the control of blight and blister cankers. If any dressing is required, white lead in linseed oil is the most durable and only slightly more expensive per tree than the other dressings used.

The handling and storage of apples in the Pacific Northwest. H. J. RAMSEY, A. W. MCKAY, E. L. MARKELL, and H. S. BIRD (*U. S. Dept. Agr. Bul. 587 (1917), pp. 31, pls. 7*).—This bulletin presents the results of extensive investigations conducted by the department during the seasons of 1911-12 to 1914-15 to determine those factors which are of greatest importance to the successful storage of the apples of the Pacific Northwest. The apples used in the work were secured from the more important apple-growing sections of Washington, Oregon, Idaho, and Montana.

In the experiments apples held in storage at 32° F. showed a wide range in the cold-storage keeping qualities of the different varieties, depending upon the decay, skin blemish, texture changes, etc., which they develop. A two weeks' delay between the picking and storage of apples often greatly reduces their life in storage through more rapid ripening and the development of scald, Jonathan spot, scab, and decay. The apples kept longer and in better condition at 32° than at 35°, the difference in favor of the former temperature increasing with the time in storage.

Immature picking resulted in severe scald and early decay of apples in storage and the storage of over-mature apples was an equally bad or worse practice. Well-colored portions of the skin seldom, if ever, develop scald. Apples from orchards badly infected with northwestern anthracnose tend to decay early in their storage life.

It is pointed out that carelessness in handling previous to storage is responsible for considerable decay of apples in storage, and that the successful cold storage of apples depends as much on the treatment they receive before storage as on the conditions and temperatures under which they are held in storage.

In connection with the work as a whole some limited data were secured on the common storage of apples. Although these data are not conclusive they indicate at least that a common storage house cooled by natural circulation only can not take the place of a cold-storage warehouse for long keeping of the fruit. The bulletin concludes with tabular data and notes on the cold-storage keeping qualities of varieties of apples grown in the Pacific Northwest.

Strawberry culture in Tennessee, Kentucky, and West Virginia. G. M. DABROW (*U. S. Dept. Agr., Farmers' Bul. 854 (1917), pp. 23, figs. 11*).—This dis-

compares the different cultural methods used in Tennessee, Kentucky, and West Virginia, and points out those which have been demonstrated by experience to be the most efficient. The subject matter is presented under the general headings of methods of culture, extent of strawberry shipments from Tennessee and Kentucky, selection of a suitable location for growing strawberries, site for a strawberry field, preparation of the soil, fertilizers, planting, system of training, care during the first summer, mulching, renewing the plantation, harvesting, and varieties.

Increase the grape yield by spraying for insects and diseases, A. L. QUAINANCE and C. L. SHEAR (*Nebr. Hort.*, 7 (1917), No. 4, pp. 4-6).—This paper contains directions for the control of the more important insect and fungus pests of American varieties of grapes east of the Rocky Mountains.

The fertilization of citrus, W. P. KELLEY (*California Sta. Circ.* 171 (1917), pp. 4).—This circular points out the more important lessons taught by various fertilizer investigations with citrus fruits conducted in California in recent years.

All of these lines of investigation and practical experience show the special importance of nitrogenous fertilizers on the citrus soils of California. Phosphoric acid is required to some extent, but the soils are, generally speaking, well supplied with potash.

[Manurial experiments with coconuts and vanilla], P. R. DUPONT (*Ann. Rpt. Agr. and Crown Lands Seychelles*, 1916, pp. 5, 6, 9).—A manurial experiment with coconut trees started by the Seychelles Botanic Station in 1916 is here outlined and the natural yield of each plot for 1916 is given. The experiment is to be continued a number of years. Data are also given on a manurial experiment with vanilla vines that has been under way for two years.

The effect of large applications of commercial fertilizers on carnations, F. W. MUNCIE (*Thesis, Univ. Ill.*, 1915, pp. 23).—The data presented in this paper have been noted from another source (*E. S. R.*, 36, p. 445).

Transplanting trees (*Missouri Bot. Gard. Bul.*, 5 (1917), No. 12, pp. 167-172, pls. 3, fig. 1).—Methods of transplanting large trees are illustrated and described.

FORESTRY.

The forests of Maryland, F. W. BESLEY (*Baltimore: Md. State Bd. Forestry*, 1916, pp. 152, pls. 40).—The results are given of a forest survey of the counties of Maryland begun in 1907, with a separate map for each county showing the character and extent of the forest areas and the approximate stand of timber.

Introductory considerations deal with the present forest conditions in the State as a whole, their value to the people, and how they may best be conserved, native forest trees, principal and special uses of the forests, wood-using industries, transportation, markets, forest planting, State forest reserves, municipal forests, etc. A summary of the production of lumber, timber, and by-products in 1914, together with the forest laws of Maryland, is also included.

Forestry investigations (*Minnesota Sta., Rpt. Grand Rapids Substa.*, 1916, pp. 57-60, figs. 3).—The present condition of the forest plantation is noted and data are given showing the growth of Norway, white, Scotch, and jack pines planted in 1900 and 1901 at varying distances, alone, and in combination.

Forest progress in the Drakensberg, J. S. HENKEL (*So. African Jour. Sci.*, 13 (1916), No. 5, pp. 179-188, figs. 2).—This comprises observations on forest growth in the Drakensberg, Natal, South Africa.

Statistics compiled in the office of the silviculturist, Forest Research Institute, Dehra Dun, during 1915-16, E. MARSDEN (*Indian Forest Rec.*, 6

(1917), No. 2, pp. IV+62, pls. 3).—This comprises statistics relative to girth increment, volume increment, and yield of a number of Indian trees.

Report of the director of forests, N. W. JOLLY (*Ann. Rpt. Dept. Pub. Lands Queensland, 1916*, pp. 50-56, pls. 3).—A progress report on the administration and management of the State forests and national parks of Queensland for the year 1916. Data relative to alterations in forest areas, timber yields, revenues, expenditures, etc., are included.

Evaporation records from the Gulf coast, LAURA GANO and J. MCNEILL (*Bot. Gaz.*, 64 (1917), No. 4, pp. 318-323, figs. 4).—In connection with field work in daily rate of evaporation in several of the typical plant associations were kept, some of them running through a period of 19 months. The recording stations are here described, and the average monthly and yearly rates of evaporation Gulf coast forest associations and their relations in succession, records of the northern Florida undertaken to determine the composition and limits of certain are presented in a series of charts and discussed.

"Black storms" and their relation to forestry, L. KIRILLOV (*Selsk. Khoz. i Lesov.*, 258 (1916), Nov.-Dec., pp. 48-74).—The author gives an account of soil abrasion by storms in the fertile black belt of Russia and the prevention of such abrasion by afforestation. Among the trees used for this purpose are the common pine (*Pinus sylvestris*), red cedar, white birch, blackthorn (*Prunus spinosa*), and *Juniperus sabina*.

Trees recommended for planting, J. F. ROCK (*Hawaii, Forester and Agr.*, 14 (1917), No. 11, pp. 331-337).—In this paper the author gives a list of trees recommended for planting in Hawaii, with reference to the conservation of water and the protection of watersheds, prevention of sand or dust drifting, and the reforestation of eroded and arid areas on slopes of mountain ranges and on plains.

Forest fire prevention in cooperation with the Federal Government, J. H. FOSTER and F. H. MULLEN (*Bul. Agr. and Mech. Col. Tex.*, 3, ser., 3 (1917), No. 13, pp. 12, fig. 1).—An account of the development of forest fire prevention work in Texas, including data on the results secured in the fall of 1916 and spring of 1917.

Forest depredation and utilization, F. W. RANE (*Proc. Soc. Prom. Agr. Sci.*, 37 (1916), pp. 73-82).—A discussion of forest utilization as a factor in controlling the depredations of the gipsy and brown-tail moths, based upon results secured in Massachusetts.

Natural reproduction from seed stored in the forest floor, J. V. HOFMANN (*U. S. Dept. Agr., Jour. Agr. Research*, 11 (1917), No. 1, pp. 1-26, pls. 8, figs. 4).—The results are given of a five-year study of some 750,000 acres of burns and 7,780 acres of cut-over land in the Pacific Northwest conducted to determine the true source of seed of young stands of Douglas fir and western white pine that spring up on these burns and cut-over areas. Summing up the evidence as a whole the author reached the following conclusions:

"The distance to which seed trees are capable of restocking the ground is limited to from 150 to 300 ft. They can not, therefore, account for the restocking of the large burned areas. The irregular, dense stands of young growth are due to seed stored in the forest floor or in cones. This seed retains its viability through the fire and is responsible for the dense reproduction that springs up after the first fire. The even-aged stands of reproduction immediately following a fire, regardless of location of remaining seed trees, the irregular alternation of dense stands of reproduction with grass areas, and the failure of reproduction on areas burned over by a second fire before the stand reaches seeding age or by consuming all of the duff and precluding any possibility of

seed remaining after the fire, all point to the seed stored in the duff as the principal source of seed responsible for the restocking.

"The ability of the seed to retain its viability when stored in the duff or when retained in cones during fires has been further demonstrated by recovering and germinating seed from duff under forest conditions and by recovering and germinating seed from cones which pass through a crown fire."

The red spruce: Its growth and management, L. S. MURPHY (*U. S. Dept. Agr. Bul. 544* (1917), pp. 100, pls. 7, figs. 5).—The chief purpose of this bulletin is to formulate definite systems of forest management for various conditions. The subject matter as a whole is based upon the author's field investigations of second growth spruce and upon the literature dealing with virgin stands, including unpublished data collected by various members of the Forest Service. The phases discussed include uses of spruce, amount and value of spruce cut and imported, present stand of spruce, value of spruce and spruce stumpage, range and distribution, forest types, second growth stands of spruce, soil and moisture requirements, light requirements, wind firmness, reproduction, form, length of life and maximum size, susceptibility to injury, growth, stands and yields, methods of cutting, brush disposal, sowing and planting, and rotation. Appended to the bulletin are volume tables, taper measurements, stand tables, and sample plot data for spruce.

Preliminary study of white spruce in Minnesota, W. H. KENNEY (*Minnesota Sta. Bul. 168* (1917), pp. 5-30, figs. 12).—This bulletin presents data on the soil requirements, growth, yield, and distribution of white spruce in Minnesota, together with the approximate returns which may be expected from young stands or plantations and suggestions relative to possibilities of private investments and a rational system of taxing forest lands. The salient features of the Massachusetts forest taxation law are given.

Note on red sanders (*Pterocarpus santalinus*), T. A. WHITEHEAD (*Indian Forest Bul. 34* (1917), pp. 10, pls. 4).—A descriptive account of the red sanders tree (*P. santalinus*) with reference to its botany, habitat, distribution, and uses. The paper is accompanied by an actual wood specimen of the tree.

Preliminary review of the properties of rubber of different grades, O. DE VRIES and H. J. HELLEDOORN (*Arch. Rubbercult. Nederland. Indië, 1* (1917), No. 4, pp. 213-233, figs. 5).—Data are given showing the viscosity, tensile strength, rate of cure, and slope of a number of rubber samples tested at the Central Rubber Station.

On the relation between specific gravity and rubber content of latex, also with regard to the use of hydrometers, O. DE VRIES (*Arch. Rubbercult. Nederland. Indië, 1* (1917), No. 4, pp. 242-279, figs. 3).—A discussion of these subjects based upon investigations conducted by several experiment stations in the Netherlands Indies.

Some remarks on the properties of rubber from one group of trees, and on the influence of the tapping system, O. DE VRIES (*Arch. Rubbercult. Nederland. Indië, 1* (1917), No. 4, pp. 280-288).—The discussion of this paper is based upon the above-noted investigation.

Wood utilization directory of New York, J. HARRIS, N. C. BROWN, and H. H. TRYON (*Syracuse Univ. [Pub.], 17* (1917), No. 5, pp. 204, pl. 1, figs. 11).—This bulletin, which was prepared by the New York State College of Forestry in cooperation with the Forest Service of the U. S. Department of Agriculture, contains a summary of woods used and total amount of lumber consumed in each industry, tables showing the use of woods in each industry and how each species is used, and a directory of the wood-using industries in the State.

Forest products of Canada, 1916.—Lumber, lath, and shingles (*Dept. Int. Canada, Forestry Branch Bul. 62A* (1917), pp. 23, figs. 3).—Statistics are given

for 1916 showing the lumber, lath, and shingle cut by Provinces and by kinds of wood. The value was, for lumber, \$58,865,349; lath, \$1,743,940; and shingles, \$5,042,963.

Forest products of Canada, 1916.—Poles and cross-ties (Dept. Int. Canada, Forestry Branch Bul. 620 (1917), pp. 8, figs. 2).—A statistical report on poles and cross-ties purchased in Canada during 1916, with comparative data for 1915.

DISEASES OF PLANTS.

A textbook of mycology and plant pathology, J. W. HARRSHRECKER (Philadelphia: P. Blakiston's Son & Co., 1917, pp. XIII+779, figs. 271).—This book is the outgrowth of the author's 27 years' experience as a teacher of botany, during which time he conducted graduate courses in the morphology, classification, and physiology of the fungi, and also courses in the methods used by bacteriologists and mycologists.

The arrangement of the material is that suggested by the needs of the classroom and laboratory. The principal divisions of the text are mycology, general plant pathology, special plant pathology, and laboratory exercises in the cultural study of fungi. In a series of appendixes the author gives formulas for fungicides, spray calendars, keys for the determination of the genera and species of a number of groups of fungi, and directions for the culture of mushrooms and for the collection and preservation of fleshy fungi.

Plant diseases in Canada, H. T. GÜSSOW (Science, n. ser., 46 (1917), No. 1189, p. 362).—The author reports having observed in the Dominion of Canada *Dothichiza populea* on Lombardy poplar, *Colletotrichum cereale* on spring wheat, and *Leptosphaeria napi* on the seed pods of turnips grown for seed.

Noteworthy Porto Rican plant diseases, F. L. STEVENS (Phytopathology, 7 (1917), No. 2, pp. 134-134).—Notes are given on a number of plant diseases observed by the author in Porto Rico.

Diseases and injuries of plants, J. RITZEMA BOS (Meded. Rijkse Hoogers Land, Tuin en Boschbouwsch. [Wageningen], 11 (1917), No. 5, pp. 175-215, 244-250).—The portions here noted include accounts of unfavorable or injurious conditions affecting economic plants, such as inorganic agencies (weather, soil, and spray injury), animal parasites (including nematodes), cryptogamic diseases, and causes of undetermined character.

Pythiacystis related to Phytophthora, J. T. BARRETT (Abstr. in Phytopathology, 7 (1917), No. 2, pp. 150, 151).—From a study of three strains of *Pythiacystis citrophthora*, the author found close similarity of the oogonia, oospores, and antheridia to those of *Phytophthora cactorum*. This marked similarity is believed to indicate a close relationship between the two genera.

Puccinia glumarum, H. B. HUMPHREY (Phytopathology, 7 (1917), No. 2, pp. 142, 143).—Evidence is presented indicating that *P. glumarum* has been present in America at least 25 years and possibly longer, and that it is not of recent introduction, as previously reported (E. S. R., 33, p. 744).

A new parasitic nema found infesting cotton and potatoes, N. A. COBB (U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 1, pp. 27-33, figs. 5).—A new parasitic nematode which has been found infesting the tubers of the potato, the feeding roots of camphor, the rootstocks of violets, and the roots of upland cotton is here described as *Tylenchus penetrans*.

External indications of the presence of the nema are the existence on the roots or tubers of small, abnormal-looking areas, a few millimeters across, sometimes in the form of pimples, but more often in the form of slightly sunken, discolored areas. Each of these diseased areas when fully developed contains up to about 50 specimens of *T. penetrans* in various stages of growth.

"The geographical distribution of the pest is suggested by its prevalence in Florida, Georgia, North Carolina, New York, and Michigan. The occurrence of this disease under such different climatic conditions and in such a diversity of hosts makes it certain that the nema causing it is another species which, like some other destructive members of its genus, can adapt itself to widely varying conditions. As yet too little is known about this parasite to accurately estimate the damage done by it.

"The occurrence of the parasite in the tubers of the potato is a particularly significant fact and again points to the necessity of being particularly careful to plant only perfectly healthy potatoes. The mercuric-chlorid treatment of potatoes, as for scab, decreases the vitality of the nemas."

Cereal smuts, V. ZEMAN (Rev. Facult. Agron. y Vet. La Plata, 2. ser., 12 (1917), No. 3, pp. 330-340).—This is a discussion of *Ustilago tritici*, *Tilletia tritici*, and *T. levis* on wheat; *U. nuda* and *U. hordei* on barley; *U. avenae* and *U. larvis* on oats; and *U. maydis* on maize, as regards the forms and effects of attack and control measures available in Argentina.

Overwintering and distribution of cereal rusts in a subtropical climate, G. GASSNER (Ztschr. Pflanzenkrankh., 26 (1916), No. 6-7, pp. 323-374).—In pursuance of an account previously noted (E. S. R., 36, p. 542), the author discusses overwintering of cereal rusts and the significance of host alternation in the eastern subtropical parts of South America, overwintering by the uredo form in the warmer regions, spore distribution by air movements, and rust dissemination by means of seed.

In spite of the fact that teleutospores were regularly produced, it could not be shown that this method or that of host alternation was employed as a means of overwintering by *Puccinia graminis*, *P. maydis*, *P. triticea*, or *P. coronifera*. The seed were not shown to carry over the infection regularly, nor was there any evidence of the presence of a mycoplasma. It is thought that *P. graminis* and *P. maydis* overwintering elsewhere may be brought by air currents, the uredo form of the former fungus being known to winter in southern, the second in tropical, Brazil. Evidence regarding the agency of air currents is discussed.

Frost injury to cereals, H. ZIMMERMANN (Ztschr. Pflanzenkrankh., 26 (1916), No. 6-7, pp. 321-323, pl. 1).—The effect is described (principally on rye, also on wheat and rye grass) of freezing alternating with warmer weather during parts of March, 1915, in Mecklenburg-Schwerin and Mecklenburg-Strelitz. The plantlets were loosened, the root system was largely suppressed, the plants were stunted and weakened, and attacks by nematodes and insects were apparently increased.

A girdling of bean stems caused by *Bacterium phaseoli*, J. H. MUNON (Science, n. ser., 46 (1917), No. 1178, pp. 88, 89).—The author reports having found in July, 1914, a peculiar girdling of the stems and branches of field beans in several localities in Michigan. Since that time the disease has been collected in various parts of the State.

The disease appears at the nodes of stems and branches as small, water-soaked spots. These enlarge, encircling the affected parts. Later these diseased areas become amber colored and the girdling is usually completed by the time the pods are half mature. The diseased tissue is said to be so weakened that the stem breaks at the affected node. The signs of the disease may appear on the stems before there is any evidence of the bacterial blight on the pods. Inoculations into stem nodes of healthy plants with pure cultures of *B. phaseoli* have produced typical signs of the disease.

It is believed that infection results from the washing of bacteria from affected cotyledons or leaves to the axils of the leaves, but the method of entry of the organism has not yet been determined.

The susceptibility of *Phaseolus vulgaris* to bean rust, E. JORDI (Zentralblatt, 28 (1916), No. 6-7, pp. 374, 375).—This is a brief account of the considerable differences noted in the resistance offered to bean rust by certain varieties of *P. vulgaris*.

On a sudden outbreak of cotton rust in Texas, J. J. TAUBENHAUS (Science, n. ser., 48 (1917), No. 1185, pp. 267-269).—The author reports having had his attention called in June, 1917, to an outbreak of cotton rust in Texas, the cause of the disease being *Hoidium gossypii*. The distribution of the disease was studied to some extent and attempts made to find the alternate stage of the fungus on grasses, particularly species of *Muhlenbergia* or *Sporobolus*, but so far without result. Investigation is being continued in the hope that the *Puccinia* stage will be found, so that the host upon which the organism hibernates may be discovered, thereby preventing further spread of the rust.

Lightning injury to kale, L. R. JONES (Phytopathology, 7 (1917), No. 2, pp. 140-142, fig. 1).—A brief account is given of lightning injury to a field of kale at Rochester, Mich.

A physiological study of two strains of *Fusarium* in their causal relation to tuber rot and wilt of potato, G. K. K. LINK (Bot. Gaz., 62 (1916), No. 3, pp. 169-209, figs. 13).—A detailed account of work previously reported (E. S. R., 35, p. 246).

The mosaic disease of potatoes, P. A. MURPHY (Agr. Gaz. Canada, 4 (1917), No. 5, pp. 345-349, figs. 2).—Losses of varying importance due to potato mosaic are indicated for localities in eastern Canada, extending westward. The disease varies somewhat in its manifestations as described. Though the infection does not pass from one tuber to another through cut surfaces, it is perpetuated by planting tubers from diseased hills. Experimentation is still in progress.

Experiments in the control of potato leak, L. A. HAWKINS (U. S. Dept. Agr. Bul. 577 (1917), pp. 5).—In a previous publication (E. S. R., 35, p. 751), the author described a disease of potatoes due to *Rhizopus nigricans*, or, more frequently, to *Pythium debaryanum*.

In the present paper an account is given of experiments in the control of the disease, with additional data on the causal organism and its occurrence in the delta soils of California. It has been found that the disease most frequently follows injury to tubers due to wounding at the time of digging and breaking off the knobs.

Avoidance of wounds and sorting out and shipping or storing separately the wounded tubers are recommended as preventive measures.

Losses of potato growers, E. J. WORTLEY (Rpt. Bd. Agr. Bermuda, 1914-15, p. 24-27).—An inheritable potato leaf roll of obscure but probably nonparasitic causation is said to correspond somewhat closely as regards symptoms with the one described by Orton (E. S. R., 30, p. 649). A description is given of potato mosaic, with an account of tests supposed to show that this disease is transmitted from mosaic parents, and that the yield from mosaic plants is less than half that from healthy stock. The trouble in Bermuda is thought to originate in the localities named from which the seed potatoes are obtained.

Report on potato diseases in Bermuda, W. A. ORTON (Rpt. Bd. Agr. Bermuda, 1914-15, pp. 13-15).—Local conditions greatly favor *Phytophthora infestans*, the control of which requires thorough and frequent spraying by means of powerful spray pumps with improved nozzles to reduce the liquid to a fine mist, also rigid selection of seed potatoes, and, if possible, a more resistant variety than those now in use locally. Common scab (*Oospora scabies*), russet scab (*Rhizoctonia*), and blackleg are now of minor importance here. Curly dwarf and mosaic exist on the island, as does also a leaf roll which has not

been proved to be identical with the inheritable form found elsewhere. No powdery scab or wart disease has been reported from Bermuda, the inspection system appearing to be entirely adequate.

A new disease of sugar cane, J. A. STEVENSON (*Porto Rico Dept. Agr. Sta. Circ. 11* (1917), Spanish Ed., pp. 12; noted in *La Planter*, 29 (1917), No. 5, pp. 76-78; *Agr. News* [Barbados], 16 (1917), No. 401, p. 286).—An account is given of a disease recently observed in Porto Rico, which is characterized by a peculiar mottling of the leaves. The leaves, however, differ distinctly from those affected with chlorosis in that they are marked with numerous white or yellow spots and stripes with irregular margins. Affected stools are said to be dwarfed, and in advanced stages of the disease the ratoons are very much stunted. The disease is capable of being transmitted through the planting of affected canes, and varieties seem to differ with regard to the extent to which they are susceptible to attack. No definite cause is as yet known, but the author suggests some similarity between this disease and the scorch disease of the East Indies.

Control measures recommended include increased fertilization, liming, thorough preparation of the soil, selection of disease-free seed, use of new land, and rotation of crops.

Bacterial leaf spot of tobacco, F. A. WOLF and A. C. FORTER (*Science*, 46 (1917), No. 1189, pp. 361, 362).—Leaf spot of tobacco is said to have been found in certain sections of North Carolina, where the disease, because of the rapidity with which it spreads, has been given the popular name "wild fire." The disease is said to manifest itself first in destructive form at the time of transplanting, and from observations it is believed that the trouble is introduced from the seed beds.

Leaf spot, it is stated, first appears as circular yellow spots about 1 cm. in diameter, with a minute brown area in the center of the spots. Within a few days the brown areas become enlarged to 2 or 3 cm. in diameter, and where the spots are numerous they fuse, giving large, brown, irregular areas which in severe cases involve most of the leaf tissue.

The authors have isolated a grayish-white bacterial organism, and inoculation experiments have proved that it is the cause of the disease. The organism appears to be undescribed, and the name *Bacterium tabacum* n. sp. is given it.

A detailed account of culture studies and inoculation experiments is reserved for a subsequent publication.

On a case of recovery from mosaic disease of tomato, W. B. BRIERLEY (*Ann. Appl. Biol.*, 2 (1916), No. 4, pp. 265-266).—In view of the alleged demonstration of the presence of mosaic virus in plants showing no external symptoms of the disease, the author has experimented with shoots apparently healthy, though springing from a diseased stock. Inoculation proved that the original plants suffered from an attack of this disease, also that the sap of the shoots apparently free does not produce infection. There remains the important question as to whether the new shoots growing out of the calicoed stock acquired immunity from the disease.

The leaf spot disease of tomato, G. H. COONS and E. LEVIN (*Michigan Sta. Spec. Bul.* 81 (1917), pp. 15, figs. 7).—Leaf spot of tomatoes due to *Septoria lycopersici* is described and directions given for spraying with Bordeaux mixture for its control.

Tomato diseases, H. W. BARRIE and J. L. SEAL (*South Carolina Sta. Circ.* 2 (1917), pp. 2).—The wilts, leaf diseases, root knot, and fruit rots to which the tomato is subject are described and control measures, so far as any are known, are given.

Overwintering of the apple scab fungus, W. P. FRASER (*Science*, n. ser., 46 (1917), No. 1183, pp. 229-232).—The author reports having observed the apple scab fungus (*Venturia inaequalis*) on young shoots of the apple in the fall of 1915. Subsequent to that time, in different sections of Nova Scotia, a number of orchards have been examined where there was a severe twig injury due to scab.

The author is convinced that, at least near the coast, apple scab may overwinter on the twigs of susceptible varieties of apple, such as Fameuse and McIntosh, occurring as dormant stroma and producing abundant conidia in the spring. Observations made late in the fall indicate that the conidia are more resistant to low temperature than is generally supposed.

Three cedar rust fungi, their life histories and the diseases they produce, J. L. WINTER (*New York Cornell Sta. Bul.* 390 (1917), pp. 507-549, figs. 22).—The author gives an account of investigations of the species of *Gymnosporangium* occurring on cedar, *G. juniperi-virginianae*, which has for its alternate host the apple; *G. globosum*, which occurs also on quince, pear, and *Crataegus*; and *G. clavipes*, which attacks in its asexual form the quince and *Crataegus*.

Inoculations on *Ribes* with *Cronartium ribicola*, P. SPAULDING and G. F. GRAYATT (*Science*, n. ser., 46 (1917), No. 1184, pp. 243, 244).—In order to determine the possible resistance of species of *Ribes* to the white pine blister rust, the authors conducted inoculation experiments under controlled conditions on 82 varieties of cultivated red, black, and white currants, 23 varieties of cultivated gooseberries, and 42 species and hybrids of *Ribes* from various parts of the world.

The varieties of cultivated species of *Ribes* were found to show considerable variation in their susceptibility to disease.

In addition to the above species and hybrids, successful inoculations are reported on numerous unidentified species of *Ribes*, including over 100 collections made in the Northwest and Pacific Coast States. Thus far no species has proved to be entirely resistant to the rust.

[Plant diseases, 1914-15] (*Programm u. Jahresber. K. K. Hdh. Lehranst. Wein u. Obstbau Klosterneuburg, 1914-15*, pp. 64-70).—A brief account is given of injury from *Peronospora* as related to variety and to treatments with Peracid, also of chlorosis as influenced by the use of iron salts.

Plant diseases and control (*Programm u. Jahresber. K. K. Hdh. Lehranst. Wein u. Obstbau Klosterneuburg, 1915-16*, pp. 76-79, fig. 1).—This is a brief account of variety tests with several proprietary or standard preparations in connection with *Peronospora* on grapevines.

The question of curing roncet, E. PANTANELLI (*Staz. Sper. Agr. Ital.*, 49 (1916), No. 5-6, pp. 249-258).—The author, in continuation of report and discussion regarding studies on the abnormality known as roncet (E. S. R., 23, p. 851), states that this condition tends to persist in shoots from the mother grapevine, although it may show a decrease or apparently disappear in summer with the increased root development. The actual nature and cause of the trouble are still unknown. Material taken from vines affected with this trouble apparently tends to produce vines equally affected. It has not been established that living material from affected plants, if given favorable soil or climate, will recover, hence rigorous avoidance of the use of all such material is recommended.

Dieback, or exanthema, of citrus trees, B. F. FLOYD (*Florida Sta. Bul.* 140 (1917), pp. 31, figs. 15).—The author gives a popular summary of information concerning this disease, its cause and treatment.

Dieback of citrus trees is said to be a disease of the growing tissues, the primary symptoms of which are the formation of gum pockets, the stained

terminal branches, the marked or ammoniated fruits, the bark excrescences, and the multiple buds. The secondary symptoms are an exceptionally deep green color of the foliage, a distorted growth of the immature angular terminal branches, frenching of the foliage, and thick, coarse, and somewhat peach-leaf shaped leaves.

The definite cause of dieback is not known, although it is supposed to be connected in some way with organic matter in the soil. Conditions known to be favorable to dieback are the presence of excessive quantities of ammoniates, a lack of drainage, hardpan too near the soil surface, excessive cultivation, and irregular moisture conditions.

The disease may be controlled by correcting the above soil conditions, and affected trees may be cured by the use of copper sulphate on the soil and beneath the bark of the trees and by spraying with Bordeaux mixture.

Armillaria root rot on the English walnut, K. PEARCY (*Amer. Nut Jour.*, 6 (1917), No. 6, p. 85).—Giving the results of experience with *Armillaria* root rot attacking English walnuts of all ages and at all seasons locally, the author states that where the dirt was dug away until the graft unions were exposed, cylinders of heavy roofing paper placed around the bases of the trees, and the soil filled in around them afterwards, no more trees were lost in that planting. These cylinders have to be kept cleaned out each year of such dirt as may fall into them during cultivation. Holes where dead trees have been dug out must be left open to the sunshine for a time to kill any portions of the fungus that may be exposed.

A new disease of cultivated Pelargonium, A. LINGELSHHEIM (*Ztschr. Pflanzenkrankh.*, 26 (1916), No. 6-7, pp. 375-378, figs. 2).—A brief description and discussion are given of a speckled appearance twice observed in young leaves of Pelargonium. The phenomenon becomes more apparent in the older leaves. The cause is thought to be defective development of some of the parenchymal cells as regards size and chlorophyll content. The observed phenomena are compared with some reported by other authors.

Hybrids and other new chestnuts for blight districts, W. VAN FLEET (*North. Nut Growers Assoc. Proc.*, 7 (1916), pp. 54-58).—It is stated that no diminution in the virulence of the chestnut-bark disease is yet apparent, the disease having spread within a little more than ten years from a point near New York City into 13 States, practically reaching the eastern and northern limits of chestnut growth and sparing no individual trees exposed to infection, so that the American chestnut as a forest asset is likely soon to disappear.

Chestnut trees are killed in a short time, though a duration of five to eight years has been noted. The fungus probably does not, however, attack very harmfully even closely allied forms. Certain Asiatic forms, as *Castanea orenata* of Japan and eastern China and *C. mollissima* of the interior are most promising in this respect. *C. sativa*, the commercial chestnut of Europe, has a resistance somewhat higher than that of *C. americana*. *C. pumila* often escapes infection owing, supposedly, to its small size, smooth bark, and comparative freedom from insect attack.

Crosses of chinquapin with Japanese chestnut have shown a hopeful degree of resistance or of recuperative power, and some of these show considerable promise as nut producers in regard to quantity and quality, early ripening, and vigor of the trees. Observations and tests are still in progress.

New hosts for *Razoumofskyia americana* and *R. occidentalis abietina*, J. R. WEIB (*Phytopathology*, 7 (1917), No. 2, p. 140).—The author reports the occurrence of *R. americana* on *Pinus attenuata* and of *R. occidentalis abietina* on *Abies nobilis* and *A. amabilis*.

Report on the South American leaf disease of the Para rubber tree, C. K. ANOMOT (Reprint in Jour. Bd. Agr. Brit. Guiana, 10 (1916), No. 1, pp. 13-14).—It is stated that the leaf disease of *Hevea* appeared sporadically in British Guiana in 1908 and more abundantly in 1914, and that it is now more or less prevalent in all parts of the colony except along the coast. It is said to be caused by *Fusicladium macrosporum*.

The characteristic symptom is the dying back of the branches toward the stem. The rapidly reproducing form of spores occurs on young leaves and twigs recently attacked, the other two (which may supposedly together represent a resting stage) occur principally on old and fallen leaves. The same disease is said to occur in Dutch Guiana and in Brazil.

The leaf disease is affected by dryness (tending to defoliation) and by a high day temperature. Leaves are most susceptible to attack when one or two weeks old and 3 to 5 in. long. The disease has been observed on two wild forest species of *Hevea*, but on no other wild plants.

A Bordeaux spray is recommended. Sanitary measures include open planting; removal of fallen leaves, dead wood, and wild *Hevea*; and treatment of wounds with tar or some other reliable disinfectant.

Control measures for the South American *Hevea* leaf disease, G. STABEL Meded. Dept. Landb. Suriname, No. 6 (1916); Indische Mercur, 39 (1916), p. 43, pp. 366, 367.—This is a reprint of a pamphlet summarizing the contents of a forthcoming bulletin.

The author states that the *Hevea* leaf disease fungus has three forms of fructification, perithecia, pycnidia, and conidia, all of which were studied, the conidia (the *Scolecotrichum* form of fructification) proving to be almost the sole means of propagation used by the fungus. While full-grown leaves are somewhat resistant, young leaves are readily infected.

It is recommended that occasionally the young leaves and shoots be kept down on affected estates for a period of from two to four weeks. Measures proposed by Bancroft in his article above noted are criticized.

Fighting the South American leaf disease of *Hevea* (Jour. Bd. Agr. Brit. Guiana, 10 (1916), No. 1, pp. 1-4).—This note refers to the work by Bancroft and summarizes that of Stabel, both of which are noted above.

An abnormal leaf fall in *Hevea*, P. ARENS (Meded. Proefstat. Malang, No. 14 (1916), pp. 6-13).—In two cases of premature leaf fall observed to occur during the heavy rains in the Malang country, a parasitic fungus was found which is said to be *Neozimmermannia (Glomerispora) elastica*. No definite result followed artificial infection with the organism, which may therefore depend on the sensitizing effects of wet weather. The leaf-fall organism of India (*Ayrophthora* sp.) and the one found in Surinam have not yet appeared in this chipelago.

The efficacy of acid, neutral, or alkaline Bordeaux mixture, V. VERMOREL and E. DANTONY (Notes Expérimentales sur l'efficacité des Bouillies Bordelaises acides, Neutres et Alcalines, Villefranche: Prog. Agr. et Vit., 1917, pp. 28, figs. 1).—Discussing the conflicting conclusions of various workers regarding the relative values of acid, alkaline, and neutral Bordeaux mixture, the authors give an account of tests made by them during 1915 and 1916 in which grape leaves, after having been sprayed, were detached day after day and tested for the presence of soluble copper.

The results led to a certain modification of the views previously expressed (R. S. R., 34, p. 540). It was found that in case of acid spray nearly all of the soluble copper disappeared in two or three weeks or even during one good rain, while in case of the alkaline solution a considerable portion of copper

remained in soluble and available form for as long as 60 days in spite of repeated rains. The alkaline Bordeaux mixture is therefore preferred.

Acid or alkaline sprays. V. VERMOREL and E. DANTONY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 18, pp. 423, 429).—In a summary of the results of recent work on Bordeaux mixtures differing in composition, the authors state that the alkaline and the acid preparations differ widely as regards their actual constitution. The acid mixture is not constituted of copper sulphate and lime in a mere mechanical mixture, but is formed of a basic sulphate and of a small quantity of normal sulphate. The alkaline preparation is entirely different, being a mixture having a great excess of sulphates of copper of very high basicity and of double sulphates of copper and lime. The authors think that there are also hydrates of copper and of lime in excess of the calcium sulphate present. A constituent common to both these forms is calcium sulphate.

Under the action of rain, as of chemical reagents, the two mixtures behave differently, the alkaline being much the more lasting. This fact is discussed, as are others, with advice against certain preparations. The authors advise strongly against the employment of the acid spray. It is claimed that excess of lime (which is regarded by some as to be avoided) is not in any way injurious.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The muskrat as a fur bearer, with notes on its use as food. D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul. 869* (1917), pp. 22, figs. 4).—This abridgement and revision of Farmers' Bulletin 393 (*E. S. R.*, 23, p. 356) calls attention to the importance of the muskrat as a fur bearer and suggests the utilization of private ponds and marsh lands for an increased production of fur and meat.

The mongoose in Barbados. W. NOWELL (*Agr. News [Barbados]*, 16 (1917), No. 396, p. 206).—The author holds the view that the increasing damage to crops by insect pests in Barbados is to a large extent due to the destruction of birds, lizards, and toads by the mongoose.

Recognition among insects. N. E. MCINDOE (*Smithson. Misc. Collect.*, 68 (1917), No. 2, pp. 78).

A manual of dangerous insects likely to be introduced in the United States through importations, edited by W. D. PIERCE (*U. S. Dept. Agr., Office Sec. [Pub.]*, 1917, pp. 256, pls. 50, figs. 107).—This manual has been prepared by the Bureau of Entomology in cooperation with the Federal Horticultural Board with a view to supplying such information as is required by their officers and others in the enforcement of quarantines and the safeguarding of this country against the introduction of foreign insect pests. A brief sketch of each of the more important insects and certain important facts concerning each plant on which they are likely to be introduced are given. The host plant arrangement has been followed, under each of which are grouped, first, the better known insects and, second, those not so well known or concerning which descriptive matter is not available. Insect and plant indexes are included.

Insects of 1916 [in Maryland]. E. N. CORY (*Rpt. Md. Agr. Soc.*, 1 (1916), pp. 200-203, pl. 1).—A brief account is given of the more injurious of some 60 insect pests of the year, including several orchard plant lice, namely, the apple aphid, oat aphid (*Aphis avenae*), and rosy aphid (*A. sorbi*). The new peach pest *Laspeyresia molesta*, which has appeared in three localities on the western shore of Chesapeake Bay but not as yet on the eastern shore, codling moth, striped turnip flea-beetle (*Phyllotreta vittata*), cabbage worms (*Pieris rapae* and *Plutia brassicae*), garden flea hopper (*Halticus oleris*), strawberry leaf

beetle (*Typhophorus caecilius*), rose midge (*Dasyneura rhodophaga*), phlox plant bug (*Leptides megia*), and catalpa midge (*Cecidomyia catalpa*) are also noted.

Sixteenth report of the State entomologist of Minnesota to the governor for the years 1915 and 1916, by F. L. WASHBURN (*Rpt. State Ent. Minn.*, 16 (1915-16), pp. 189, pt. 1, figs. 54).—A report on the Work on the White Pine Blister Rust in Minnesota, 1916, by F. L. Washburn (pp. 10-27) is followed by a Report on Nursery and Orchard Inspection and Inspection of Foreign Stock for the Years 1915-16, by F. L. Washburn (pp. 28-58); Miscellaneous Notes on Economic Work; Orchard and Shade Tree Insects, Spraying, Truck, and Field Crops, by A. G. Ruggles (pp. 59-64); Notes on Parasitic and Household Insects, by C. W. Howard (pp. 65-67); The White-Marked Tussock Moth, by A. G. Ruggles (pp. 68-70); Distribution of Fish to Minnesota Farmers, by F. L. Washburn (pp. 71, 72); The Common Mosquitoes of Minnesota, by C. W. Howard (pp. 73-92); Studies in Greenhouse Fumigation with Hydrocyanic Acid—Temperature and Moisture as Factors Influencing the Injury of Plants During Fumigation, by W. Moore (pp. 93-108); The Strawberry Weevil in Minnesota (*Anthonomus signatus*) (pp. 109-134), noted on page 163, and Insects Attacking Weeds in Minnesota (pp. 135-152), by S. Marcovitch; Minnesota Billbugs, by O. G. Babcock (pp. 153-159); and Further Observations on Minnesota Birds, Their Economic Relations to the Agriculturist, by F. L. Washburn (pp. 160-183).

[Insect pests in New Hampshire], W. C. O'KANE (*N. H. Dept. Agr., State Moth Work Circ.* [1915], Nos. 7, p. 1, figs. 1; 8, pp. 4; [1916], Nos. 10, pp. 3; 11, pp. 24, pls. 8).—These several circulars deal with grasshopper control, insect suppression-organization work, control of grasshoppers, and plan and progress of the work in 1915 and 1916, respectively.

[Report of the] division of entomology, J. G. SANDERS and S. B. FRACKER (*Wis. Dept. Agr. Bul.* 10 (1916), pp. 30-58, figs. 17).—This report deals with the inspection of nurseries and material imported into Wisconsin, white grub and grasshopper work, etc. Under the heading of Insect Notes for 1916 brief accounts are given of the onion maggot (*Hydomyia antiqua*), the poplar weevil (*Cryptorhynchus lapathi*), the cottony maple scale which is causing the death of maples, raspberry insects (particularly caterpillars of *Schreckensteinia festaliella*), a new orchid weevil (*Cholus cattleyae* [cattleyarum]) which is a source of loss in Milwaukee, and the chrysanthemum leaf miner (*Nepomyza chrysanthemi*).

In reporting upon the results obtained from the use of the poison bait spray for the onion maggot (*E. S. R.*, 33, p. 357) it is stated that only partially successful results were obtained during 1915 and 1916, due in part to unusually wet weather. It was found that a spray consisting of $\frac{1}{2}$ oz. of sodium arsenite or white arsenite, dissolved in 1 gal. of boiling water to which $\frac{1}{2}$ pint to 1 pint of black New Orleans molasses was added, was made much more attractive through soaking chopped onion in it for a time until the bait acquired a strong onion odor.

A report on aplay inspection by N. E. France (pp. 56-58) is also included.

Insects affecting agriculturists in British Columbia during the past year, R. C. TREHMANE (*Agr. Jour. [Brit. Columbia]*, 1 (1916), No. 10, p. 168; *abs. in Rev. Appl. Ent.*, Ser. A, 5 (1917), No. 3, pp. 120, 121).—This reports upon the occurrence of the more important insects of the year in British Columbia.

Proceedings of the Entomological Society of Nova Scotia for 1916 (*Proc. Ent. Soc. Nova Scotia*, 1916, pp. 64, pls. 2, figs. 13).—The papers here presented relating to economic entomology are as follows: Some Results from a Few

Combination Sprays in 1916, by W. H. Brittain (pp. 9-12); How to Collect and Preserve Insects, by L. A. DeWolfe (pp. 12-15); The Nova Scotia Division of Entomology, by W. H. Brittain (pp. 15-17); The Effect of Certain Combinations of Spraying Materials on the Set of Apples, by G. E. Sanders (pp. 17-21); The Acrididae of Nova Scotia, by C. B. Gooderham (pp. 21-30); Notes on the Apple Seed Chalcids (*Syntomaspis druparum*), by W. H. Brittain (pp. 30, 31); Biting Insects Injuring the Fruit of the Apple in Nova Scotia, by G. E. Sanders (pp. 31-33); Notes on Two Species of Tree Hoppers (Membracidae) Ovipositing in the Apple, namely, *Ceresa taurina* and *C. dudalus*, by W. H. Brittain (pp. 34-39); Arsenate of Lead Versus Arsenate of Lime, by G. E. Sanders (pp. 40-45); The Dock Sawfly (*Ametastegia glabrata* [*Taxonus nigrisoma*]), by A. G. Dustan and F. C. Gilliatt (pp. 45-48); Notes on the Rose Leafhopper (*Empoa rosea*) in Nova Scotia, W. H. Brittain and L. G. Saunders (pp. 48-51); Notes on the Rosy Aphis (*Aphis malifoliae*) in Nova Scotia, by W. H. Brittain (pp. 51-55); and The Toxic Value of Some Common Poisons Alone and in Combination with Fungicides, on a Few Species of Biting Insects, by G. E. Sanders and W. H. Brittain (pp. 55-64).

Experiments by Sanders on a small scale indicate what other field observations show, namely, that with excessively dilute fungicide solutions or alone arsenate of lime is highly dangerous to foliage, but in some manner normal solutions of lime-sulphur, barium tetrasulphid, Bordeaux, and to a great extent solutions of sodium sulphid (soluble sulphur) protect arsenate of lime from the carbon dioxide of the air and so reduce or prevent injury from it. His conclusions are substantially as follows:

Arsenic in arsenate of lime is much cheaper than in arsenate of lead, in Nova Scotia being less than 55 per cent of the cost in arsenate of lead. Per content of arsenic there is slight difference in killing power in favor of arsenate of lead. Arsenate of lime is more desirable from every standpoint to use with sulphid sprays, but should never be used alone on foliage. Lead arsenate is the best poison to use alone. Lead arsenate seems to work slightly better with Bordeaux mixture, but arsenate of lime is cheaper, so that the question of which to choose for use with Bordeaux mixture is a matter of convenience.

The studies by Brittain on the rosy aphids in Nova Scotia are in continuation of those reported in a paper previously noted (E. S. R., 35, p. 853). Data relating to the generations of the rosy aphids in 1916 are presented in tabular form and a chart is given showing the occurrence of ten generations during the year.

In reporting tests of the toxic value of some common poisons, both alone and in combination with fungicides, Sanders and Brittain present data, largely in tabular form, relating to their effect upon the brown-tail moth, tent caterpillar, fall cankerworm, white-marked tussock moth, and fall webworm. "From a study of these tables we find that the carrier of the poison, i. e., the fungicide to which it is added, has a very marked effect on its efficiency. The effect of each, calculated from the average total, may be summarized as follows:

"The four poisons used in this experiment [arsenate of lime, barium arsenate, triplumbic lead arsenate, and acid lead arsenate], when employed in combination with sodium sulphid (soluble sulphur) were 13.1 per cent more efficient than when used alone. When the poisons were added to a mixture of barium tetrasulphid and sodium sulphid their efficiency was reduced by 6.4 per cent, while, added to lime-sulphur the reduction in efficiency amounted to 19.2 per cent. Barium tetrasulphid reduced their toxic value 16 per cent and Bordeaux mixture 43.5 per cent.

"It would thus appear that with one exception, fungicides inhibit the action of arsenical poisons used in combination with them, the exception being sodium sulphid, which noticeably increases their killing power. This very marked effect

of the fungicides on the action of the poisons is difficult to explain fully. The effect of the sodium sulphid in increasing the toxicity of the various poisons is apparently due to the presence of the element sodium. A portion, at least, of its action consists, we believe, in its effect in increasing the palatability of the leaves, resulting in the larvae eating ravenously for a few days. They thus get a large amount of poison into their system in a short time, resulting in their more rapid death. The sodium sulphid also has the effect of rendering the metallic arsenates, such as lead arsenate, more active (and more dangerous to foliage) by acting upon them chemically, forming sodium arsenate and a metallic sulphid."

New records of entomogenous fungi in Barbados, W. NOWELL (*Agr. News [Barbados], 16 (1917), No. 339, p. 94*).—The author records the common occurrence of three species of fungus parasites of insects on the leaves of lime trees, namely, the common fungus *Verticillium heterocladium* on a species of citrus white fly, *Aschersonia (cubensis?)* on star scale (*Vinsonia*), and *Ophionectria coccicola* on purple scale.

[Entomological progress in India] (*Rpt. Prop. Agr. India, 1915-16, pp. 50-57*).—A brief summary of the more important results of work for the year ended June 30, 1916.

Control of some of the important garden and truck crop insects, T. J. TALBERT (*Univ. Missouri, Agr. Ext. Serv. Circ. 15 (1917), pp. 24, figs. 19*).—A popular summary of information on these insects and means for their control.

The olive insects of California, E. O. ESSIE (*California Sta. Bul. 283 (1917), pp. 43-64, figs. 21*).—A discussion of the olive insects of California and measures for their control. The more important insects considered are the black scale, the ivy or oleander scale (*Aspidiotus hederae*), the branch and twig borer (*Polycaon confertus*), and the olive bark beetle (*Luperisinus californicus*). Those of minor importance to olive trees in California include the orange thrips, the bean thrips (*Heliothrips fasciatus*), the net-winged cicada (*Platyedra areolata*), the mountain-ash louse (*Pemphigus fraxini-dipetaleae*), the red scale (*Chrysomphalus aurantii*), the purple scale, the greedy scale (*A. camelliae*), the omnivorous looper (*Sabulodes caberata*), and larvae of a pyralid moth.

Brief notes on some of the principal insects attacking the olive trees in other States and foreign countries are also included.

Important pecan insects and their control, J. B. GILL (*U. S. Dept. Agr., Farmers' Bul. 843 (1917), pp. 48, figs. 58*).—This contribution from the Bureau of Entomology reports the results of studies of the more important pecan insects, the damage caused by which amounts to hundreds of thousands of dollars annually. The insects considered in detail are the pecan nut case bearer (*Acrobasis hebesbella*), the pecan shuckworm (*Laspeyresia caryana*), and the pecan weevil (*Balaninus caryae*), which injure the nuts; the pecan leaf-case bearer (*A. nebulella*), the pecan cigar-case bearer (*Coleophora caryae-foliella*), the pecan bud moth (*Proteopteryx bolliana*), the fall webworm, the walnut caterpillar (*Dafana integerrima*), the hickory phylloxera (*Phylloxera caryocaulis*), and the little hickory aphid (*Monellia caryella*), which injure the foliage and shoots; white ants or termites (*Leucotermes flavipes*), the oak or hickory cossid (*Coasula magnifica*), the flat-headed apple-tree borer, the red-shouldered shot hole borer (*Sinoxylon*) *Xylotiops basilaris*), the belted chion (*Chion cinctus*), the hickory twig girdler (*Oncideres cingulatus*), the oak pruner (*Elaphidion vilorum*), and scale insects, which injure the trunk and branches.

[Insect enemies of the coconut palm in Netherlands Indies and their control], P. E. KRUCHENIUS (*Teymannia, 27 (1917), No. 11-12, pp. 579-642, pls. 8*).—A summary of information on the more important coconut insects.

Studies in greenhouse fumigation with hydrocyanic acid.—**Temperature and moisture as factors influencing the injury of plants during fumigation.** W. MOORE (*Rpt. State Ent. Minn., 16 (1915-16), pp. 33-103, figs. 6*).—The studies here reported are summarized as follows:

"Hydrocyanic acid may enter a plant either through the stomata or directly through the cuticle. The amount of hydrocyanic acid which will enter the cuticle of the plant depends upon the thickness and the degree to which it has been cutinized.

"Moisture on the leaves aids the gas to penetrate, but is not so important a factor where the house contains only plants with thick, heavy cuticles. Moisture may be present on the leaves from sprinkling the plants or from exudation of water from the water pores. High relative humidity at the time of fumigation aids the penetration of the gas through the cuticle, thus favoring injury. High relative humidity after fumigation tending to prevent evaporation of hydrocyanic acid in the cuticle of the plant tends to increase injury to the plants. Low temperatures at the time of fumigation and after act in a similar manner to a high relative humidity. High temperature by increasing evaporation produces results similar to a low relative humidity. Both high relative humidity and low temperature have less influence on plants with thick, waxy leaves."

Notes on American Tingidae with descriptions of new species. H. OSBORN and C. J. DRAKE (*Ohio Jour. Sci., 17 (1917), No. 8, pp. 295-307, figs. 2*).—This paper presents notes on 33 species, of which 10 species and 1 variety are described as new. Information on the food plants of many of the species is included.

The sugar cane froghopper in Grenada. J. C. HUTSON (*Agr. News [Barbados], 16 (1917), No. 389, p. 90*).—Investigations made by C. B. Williams in December, 1916, show that *Tomaspis saccharina* has been established in Grenada for many years. Actual damage to canes was reported from two estates, on one of which the injury was fairly severe.

The common mealy bug and its control in California. R. S. WOGLUM and J. D. NEULS (*U. S. Dept. Agr., Farmers' Bul. 862 (1917), pp. 16, figs. 4*).—Control measures for the citrus mealy bug, which continues to spread in California, are discussed under the headings of fumigation, spraying, and control by natural enemies. The sphere of usefulness of each and the way in which they may be combined to secure complete control are pointed out.

The banding of trees with a mixture consisting of sulphur and a sticky material to keep the Argentine and other ants off the trees forms an important part in its control. Where insect enemies are few or absent, or where the mealy bugs are themselves heavily parasitized, the trees should be sprayed or fumigated and colonies of effective enemies introduced.

The black fly and methods of controlling it. (*Agriculture [Cuba], 1 (1917), No. 5, pp. 43-49, figs. 3*).—This is an account of *Aleurocanthus woglumi*, discovered in Cuba in August, 1915, as previously noted (*E. S. R., 35, p. 532*), and measures of suppression now under way. The pest has been recently found in various gardens at Vedado, Havana.

Chermes attacking fir trees. N. A. KHOLODKOVSKII (*Khermesy Vredashchih Khvoynym Depev'iam. Petrograd: Glav. Uprav. Zemleustr. i Zemled., 1915, pp. 91, pls. 7, figs. 6*).—The author deals at length with the chermes occurring on fir trees, 11 species being considered.

Some notes on the mealy plum aphid, *Hyalopterus pruni*. F. C. WILLCOCKS (*Bul. Soc. Ent. Egypte, 9 (1916), No. 2, pp. 33-37; obs. in Rev. Appl. Ent. Ser. A, 5 (1917), No. 5, p. 188*).—This aphid, which is said to be prevalent in Egypt

in the spring on apricot and peach trees, is widely distributed in Europe and North America. Its habits in Egypt are the same as in America.

Aphis sprays. T. O. MORRISON ([*Bien.*] *Rpt. Dept. Agr. Wash.*, 2 (1915-16), pp. 33, 34).—Tests of a number of insecticides for the control of aphids led to the conclusion that tobacco sprays are the most effective. Experiments carried on with a view to lowering the cost of such applications have led to the conclusion that the effectiveness of blackleaf 40 is greatly increased by the addition of lime.

Notes on *Pediculus humanus* (vestimenti) and *P. capitia*. A. BACOT (*Brit. Med. Jour.*, No. 2392 (1916), pp. 788, 789).—These observations, which are substantially noted from another source (E. S. R., 37, p. 850), deal with the habits, length of life, and incubation of eggs of the body and head lice.

Tobacco hornworm insecticide: Recommendations for use of powdered arsenate of lead in dark-tobacco district. A. C. MOROAN (*U. S. Dept. Agr., Farmers' Bul.* 867 (1917), pp. 10).—This supersedes Farmers' Bulletin 595 (E. S. R., 31, p. 454). It gives additional recommendations for the use of powdered arsenate of lead in the control of the tobacco hornworm, based upon the results secured by agents of the Bureau of Entomology working in cooperation with tobacco growers in Kentucky and Tennessee. The use of diplumbic arsenate of lead, guaranteed to contain at least 30 per cent of arsenic oxid, of which not more than 1 per cent is free or water soluble, is strongly recommended.

The fall army worm (*Laphygma frugiperda*) in its relation to cranberry bogs. H. B. SCAMMELL (*Proc. Amer. Cranberry Growers' Assoc.*, 47 (1917), pp. 11-13).—A brief account of the attack of the cranberry in New Jersey by this army worm.

Gipsy and brown-tail moth work in Massachusetts. F. W. RANE (*Ann. Rpt. State Forester Mass.*, 12 (1915), pp. 81-85).—Brief statements of the work with parasites of the gipsy and brown-tail moths carried on by the U. S. Department of Agriculture in cooperation with the State of Massachusetts are given by L. O. Howard (pp. 81, 82) and A. F. Burgess (pp. 82-84).

The invasion of cranberry bogs by the gipsy moth was the most serious new development in connection with work with this pest.

New microbe parasites of the caterpillar of the gipsy moth. A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris]*, 164 (1917), No. 13, pp. 525-527).—The author has isolated three bacterial forma that attack the gipsy moth. These are (1) a coccobacillus identified provisionally as that described in 1913 by Picard and Blanc under the name *Bacillus lymantriae* (E. S. R., 30, p. 54); (2) a gram-positive diplococcus which differs from that found in the cockchafer and to which the author gives the name *Diplococcus lymantriae*; and (3) a gram-positive bacillus to which is given the provisional name *Bacillus liparis*. The mortality resulting from *B. lymantriae* is very low, and *D. lymantriae* is only mildly pathogenic, while *B. liparis* is more pathogenic than is *D. lymantriae*.

Measures employed in controlling the grapevine worm in Vaudois vineyards in 1916. H. FANF (*Traitements Effectués dans le Vignoble Vaudois en 1916 contre le Ver de la Vigne (Cochylis)*. Lausanne: Sta. Vit. Lausanne, 1917, pp. 23, figs. 4).—This is a report of control work with the cochylis moth.

[*Automeris janus* attacking cacao trees] (*Dept. Agr. Trinidad and Tobago, Bul.* 16 (1917), No. 1, pp. 21-23, pl. 1).—A brief note on *A. janus* is given by N. Lamont and a note on its parasite by F. W. Ulrich. This moth is found commonly in Trinidad on cacao trees and bois immortel (*Erythrina umbrosa* and *E. velutina*). That it is not a source of greater injury is said to be due to the presence of a tachinid parasite (*Willistonella esuriens*).

The olfactory organs of Lepidoptera, N. E. McINDOE (*Jour. Morph.*, 23 (1917), No. 1, pp. 33-54, figs. 10).

A classification of the Lepidoptera based on characters of the pupa, EDNA MOSHES (*Bul. Ill. State Lab. Nat. Hist.*, 12 (1916), Art. 2, pp. 13-169, pls. 9).—In this presentation of a classification of Lepidoptera, based on pupal characters, an attempt is made to throw some light on the relationships existing between the different groups.

Anopheles punctipennis.—A note on its ability to serve as a host for *Plasmodium falciparum*, M. B. MITZMAIN (*Pub. Health Rpts. [U. S.]*, 32 (1917), No. 27, pp. 1081-1083).—Further experiments (E. S. R., 35, p. 361) have shown that *A. punctipennis* is easily infectible with *P. falciparum*. One individual of a series of 16 mosquitoes and 13 individuals of a series of 36, fed a single time, were observed to become infected. Four of 8 individuals of *A. quadrimaculatus* used as controls developed infections. It is pointed out that the experimental determination of the rôle of *A. punctipennis* as a potential host for the organisms of tertian (*P. vivax*) and subtertian or estivo-autumnal (*P. falciparum*) malaria has been established by King (E. S. R., 35, p. 360).

"The present status of the common American anophelines with reference to their susceptibility to infection with the several species of malarial parasites is as follows: *A. quadrimaculatus* may serve as a host for all three parasites of malaria. *A. punctipennis* and *A. crucians* are susceptible to infection with *P. vivax* and *P. falciparum*."

A preliminary note on the rôle of blood in evolution in Culicidae, S. K. SEN (*Indian Jour. Med. Research*, 4 (1917), No. 4, pp. 729-753, figs. 2).—The author considers the experiments thus far conducted to justify the conclusions that with *Stegomyia scutellaris* the deposition of eggs is possible without any meal of blood, that an initial meal of blood may sometimes suffice for as many as three batches of eggs, and that a single fertilization suffices for several batches of eggs.

Chrysanthemum midge, A. D. BORDEN (*Amer. Florist*, 48 (1917), No. 1513, pp. 1061, 1062, figs. 3).—A brief account is given of *Diarthronomyia hypogae*, an imported European gall fly now thoroughly established in the United States, which is rapidly being distributed from State to State on infested chrysanthemum plants and cuttings. It has been known to occur in California for about 15 years, although the first published record was by Feit from Michigan in April, 1915 (E. S. R., 36, p. 855). Since this time evidence of its infestation of chrysanthemums grown under glass has been obtained from Oregon, New Jersey, Connecticut, Indiana, Pennsylvania, and Ottawa, Canada. During 1917 a number of florists reported a total loss of their chrysanthemum stock. Even in the case of a light infestation the foliage is ruined for commercial purposes, and in a heavy infestation the growth of the plants is completely arrested. Thus it is imperative in purchasing new plants and cuttings to insist on plants free from the chrysanthemum midge.

The house fly and its control, L. HASEMAN (*Univ. Missouri, Agr. Ext. Serv. Circ.* 16 (1917), pp. 11, figs. 4).—A popular summary.

Screw worms and other maggots affecting animals, F. C. BISHOP, J. D. MITCHELL, and D. C. PARMAN (*U. S. Dept. Agr., Farmers' Bul.* 857 (1917), pp. 18, figs. 9).—A brief descriptive account of several kinds of flies which infest wounds and deposit eggs on soiled wool on sheep and means for their control.

The life of the adult screw worm fly is comparatively short, ranging from 2 to 6 weeks, during which time it feeds upon various kinds of refuse and to some extent upon the nectar of flowers. The eggs are laid in batches from 1 to 4 days apart, each mass containing from 40 to 250 eggs. A single female has

been observed to deposit as many as 8 batches of eggs, containing a total of 1,228. In moist, warm weather they hatch in less than 3 hours after deposition. In living animals the larvae mature in from 4 to 5 days. From 3 to 14 days are passed in the pupal stage. The entire life cycle is completed in from 1 to 4 weeks, depending on the temperature and humidity.

The complete destruction of all dead animals is said to be the best method of control.

Other flies infesting wounds, including the sheep wool maggots, brief mention of which is made, are the black blowfly (*Phormia regina*), the green bottle fly (*Lucilia sericata*), and the gray flesh flies (*Sarcophaga texana*, *S. tuberosa*, *Sarracenioides*, and *S. robusta*).

A preliminary classification of Diptera, exclusive of Pupipara, based upon larval and pupal characters with keys to imagines in certain families, L. J. R. MALLOCH (Bul. III. State Lab. Nat. Hist., 12 (1917), Art. 3, pp. 14-161-410, pls. 30, fig. 1).—This work was prepared in response to a demand for analytical keys to the immature stages of Diptera.

The Colorado potato beetle, T. O. MORRISON ([Bien.] Rpt. Dept. Agr. Wash., 1915-16), pp. 100-103).—The appearance of the Colorado potato beetle at Sunnyside, Wash., early in July, 1916, is recorded. A survey which was at once made demonstrated the presence of this pest in 14 patches, and eradication work by means of sprays and hand picking was immediately commenced.

The white grubs injuring sugar cane in Porto Rico.—I. Life cycles of the May beetles or melolonthids, E. G. SMYTH (Jour. Dept. Agr. P. R., 1917, No. 2, pp. 47-92, pls. 8).—In this first part the author deals with the May beetles of the tribe Melolonthini, of which five species have been studied in Porto Rico, a reference to which has been noted (E. S. R., 36, p. 753). All five of these melolonthids are new to science, and four belonging to the genus Phyllophaga are being described by the author under the names *P. vandineti*, *P. portoricensis*, *P. guanicana*, and *P. citri*, as well as a single species belonging to the genus Phytalus under the name *P. insularia*. A discussion first given of the white-grub problem and of the white grubs of Porto Rico and elsewhere is followed by accounts of life-history work elsewhere, life cycles, enemies in Porto Rico, methods of rearing, etc. The life-history studies have shown that all four of these species of Phyllophaga and the single species of Phytalus require but a single year and sometimes less to undergo their life cycles.

P. vandineti, the larva of which is the worst sugar-cane pest of the island and perhaps one of the three most injurious sugar-cane white grubs in the world, is restricted to the western third of the island, having been recorded only as far east as Manati on the north coast and at Peñuelas on the south. It has reached such great abundance in this territory, particularly in the Guánica district, as to have caused whole fields of cane to fall and begin to sour in a week's time after damage first became evident. It has made the growing ofatoon cane in the Guánica and San Germán districts impossible, and in addition the cost of replanting for each crop has necessitated the continued hiring of boys to collect the grubs and beetles at a cost of hundreds of dollars in a single season. It is stated that there are cases on record where over 50 grubs of this species have been spaded out from under a single stool of cane, and it is not an uncommon occurrence to dig out 20 or more grubs from one cane stool. Due to its great abundance in the heart of the worst-infested district, where the laboratory is located, a large proportion of the studies were made of this species, the details of which are presented.

The eggs are deposited among roots in the soil in small globular pits or cavities, one egg being deposited in each pit. The average incubation period for 1,050 eggs was 14 days, the maximum 17 days in March and the minimum

10 days in September. The average period required for the development of the larva was 267 days, the maximum 356 days and the minimum 179 days, during which time 3 molts were passed. The prepupal stage was found to vary from 4 to 7 days and the average duration of the pupal stage was 21.5, the maximum being 26 and the minimum 17 days. The average normal egg-to-adult period based upon 14 complete records of single individuals was 306 days, the maximum 395 days and the minimum 212 days.

The adults differ from many species of the genus in that they are very general feeders, there being few plants that they will not touch. Experiments have shown that ordinarily the adults are only attracted to light during their flight and before they have settled on foliage to feed, i. e., from 4 to 7.30 p. m. In order to have any practical efficiency in attracting the adults of this species the lights must be placed close to the ground and started immediately at dusk, while the beetles are flying.

Mention is made of three species of birds that are important enemies of white grubs in Porto Rico and of a predacious wireworm (*Pyrophorus lunatus*). Their parasites include six scoliids (*Elis sexcincta*, *E. xanthonotus*, *Campomeris dorsata*, *C. trifasciata*, *C. pyrra*, and *Scolia atrata*), and two tachinids (*Cryptomeigenia aurifacies* and *Eutrizoides jonceti*). The eggs are attacked by mites and nematodes.

A bibliography of 36 titles is included.

White grub investigation.—A brief report of progress, A. GIBSON (*Agr. Gaz. Canada*, 4 (1917), No. 7, pp. 554-556, figs. 2).—A brief statement of progress in the work on white grubs.

Existence of many varieties and races of coccobacilli in the natural septicemias of the cockchafer, A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris]*, 163 (1916), No. 19, pp. 531-534).—The author recognizes four types of *Bacillus melolonthæ*, one representing the variety to which he gives the name *B. melolonthæ liquefaciens*, and the other three, the variety *B. melolonthæ nonliquefaciens*. Studies of a bacterial disease of the cockchafer in this country by Northrup have been noted (*E. S. R.*, 32, p. 61).

New microbe parasites of the cockchafer, A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris]*, 163 (1916), No. 24, pp. 772-774; *abs. in Jour. Roy. Micros. Soc.*, No. 2 (1917), p. 249).—While the septicemia caused by coccobacilli appear to be the principal cause of the natural mortality in cockchafers, it is not always possible to obtain pure cultures of the causative coccobacillus from the blood of affected individuals. In fact, in some 30 per cent of the cases a secondary infection accompanies the coccobacillemia. Three different associated diseases have been studied and all found in cockchafers from the Plateau of Sathonay. They are due (1) to *Bacillus melolonthæ nonliquefaciens* β and a gram-positive diplococcus (*Diplococcus melolonthæ*); (2) to *B. melolonthæ liquefaciens* and a gram-positive diplobacillus (*Diplobacillus melolonthæ*); and (3) to the same coccobacillus and a large sporulating bacillus, described as new under the name *Bacillus hoplosternus*, which takes Gram's stain poorly. *B. hoplosternus* is very pathogenic for the cockchafer and the caterpillar of *Vanessa urticae*, but does not kill the caterpillar of the gipsy moth regularly even after many passages.

The coccobacilli of the cockchafer.—Their pathogenic action on some macrolepidopterous caterpillars, A. PAILLOT (*Compt. Rend. Soc. Biol. [Paris]*, 79 (1916), No. 20, pp. 1102, 1103; *abs. in Rev. Appl. Ent., Ser. A*, 5 (1917), No. 3, p. 134).—This relates to the investigations above noted.

New microbe parasites of the cockchafer.—Pathogenic action on the caterpillars of *Vanessa urticae* and *Lymantria dispar*, and the silkworm.

A. PAILLOT (*Compt. Rend. Soc. Biol. [Paris]*, 26 (1917), No. 2, pp. 56-58).—This reports upon further studies of the coccobacilli as above noted.

Coconut beetle in Samoa (*Trop. Agr. [Ceylon]*, 48 (1917), No. 4, pp. 219-225).—This gives a report of a commission of inquiry concerning the coconut beetle (*Oryctes nasicornis*), appointed in July, 1916, by the administrator of Samoa.

The sugar cane wireworm in Fiji (*Simodactylus cinnamomeus*), R. VEITCH (*Colon. Sugar Refn. Co. [Fiji] Agr. Rpt. 1* (1916), pp. 18, pl. 1).—A report of investigations of this pest in Fiji, where it is very destructive to sugar cane sets through eating the eyes, roots, and bolls.

Canadian bark beetles.—I, Descriptions of new species, J. M. SWAINE (*Canada Dept. Agr., Ent. Branch Bul. 14* (1917), pp. 32).—Thirty-nine species of Canadian bark beetles, here described as new, represent 14 genera of which two, namely, *Pseudocryphalus* and *Pseudohylesinus*, are new.

The strawberry weevil in Minnesota, *Anthonomus signatus*, S. MARCOVITCH (*Rpt. State Ent. Minn.*, 16 (1915-16), pp. 109-134, figs. 4).—This report of investigations of this pest in 1914, is summarized by the author as follows:

"In Minnesota the adult weevils make their appearance the latter part of April or early in May, feeding on the underside of the leaves until the pollen is mature. The buds are first cut as soon as the first blossom shows and the fruit pedicels are about 2 in. high. Fields with from 40 to 95 per cent of the buds cut were not uncommon. The new brood emerges soon after picking, eating small holes on the underside of leaves. Hibernation began the latter part of August in 1915, among the dead leaves in the strawberry patch. The weevils pass the winter in the strawberry beds and not in the woods, at least in Minnesota. Old beds are more severely infested than younger ones. The natural enemies reared were five species of chalcids and one cecidomyid. The indications are that the weevils are not able to emerge when plowed under or covered with soil during cultivation.

"Since the weevils hibernate within the fields, the one-crop system will prevent severe injury. Badly infested fields should be plowed under immediately after the berries are picked. Where the two-crop system is practiced the beds should be burned over and thoroughly cultivated. Old, neglected patches should not be tolerated. The weevil will probably not be serious on the Everbearing strawberry. Covering the beds with muslin or spraying with poisonous arsenicals was not satisfactory."

A 4-page bibliography is included.

Alfalfa weevil quarantine conference, held at Salt Lake City, April 20 and 21, 1916 (*Bien. Rpt. State Hort. Com. Utah, 1915-16*, pp. 127-158).—A report of the conference, at which representatives from Montana, California, Colorado, Wyoming, Arizona, Idaho, and Utah were present.

Pineapple weevil in Above Rocks (*Jour. Jamaica Agr. Soc.*, 20 (1916), No. 9, pp. 361, 362; *Hawaii. Forester and Agr.*, 14 (1917), No. 1, pp. 20, 21).—This is a report of a second visit to the district where pineapples are badly attacked by a large black weevil (*Metamasius ritchiei*), accounts of which have been previously noted (*E. S. R.*, 37, p. 162).

Pear blossom weevil (*Anthonomus pedicularius*) in Bessarabia, S. A. МОКРЕЗСКИЙ (МОКРЕЗСКИЙ) (*Grushevii Tsiftoied* (*Anthonomus pedicularius*) в Бессарабии. Кішеней: *Salgir. Opytn. Plod. Sta.*, 1916, pp. 8, figs. 4; also in *Rev. Appl. Ent., Ser. A*, 5 (1917), No. 4, p. 158).—The larva of this weevil causes great damage to the pear in Bessarabia by devouring the lower part of both the flower and leaf buds.

Banana borer, F. WATTS (*Jour. Jamaica Agr. Soc.*, 21 (1917), No. 6, pp. 163-173).—A memorandum of information on this weevil borer (*Cosmopolites sordida*). See also a previous note (E. S.-R., 37, p. 161).

Sixteenth annual report of the Illinois State Beekeepers' Association, compiled by J. A. STONE (*Ann. Rpt. Ill. Bee-Keepers' Assoc.*, 16 (1916), pp. 170, pl. 1, figs. 20).—This includes the proceedings of the twenty-sixth annual session of the Illinois State Beekeepers' Association, held at Springfield, Ill., in November, 1916, and of the nineteenth annual convention of the Chicago-Northwestern Beekeepers' Association, held at Chicago in December, 1916. A paper on Extension Work in Beekeeping, by E. F. Phillips (pp. 121-126), is included.

First lessons in beekeeping, C. P. DADANT (*Hamilton, Ill.: Amer. Bee Jour.*, 1917, pp. [12]+167, figs. 178).—This is an entirely rewritten edition of a work published in 1911.

A thousand answers to beekeeping questions, C. C. MILLER, compiled by M. G. DADANT (*Hamilton, Ill.: Amer. Bee Jour.*, 1917, pp. 276, pl. 1, figs. 25).—This is a compilation in alphabetical order of questions culled from many thousands answered by the author during a period of 22 years in the columns of the *American Bee Journal*.

Are bees responsible for most fire blight epidemics? A. C. BURELL (*Idaho Honey Prod. Assoc. Ann. Conv.*, 6 (1917), pp. 29-67).—This address, delivered at Twin Falls, Idaho, in January, 1917, deals with the history of bees and fire blight in the United States (pp. 31-33); number of visits per day or per flower v. number of days of pome bloom-percentage of honey-bees present (pp. 33-46); causes and cases of blight on blossomless trees (pp. 46-50); relations of insects other than bees to the spread of blight (pp. 50-59); and the control of blight (pp. 60, 61); relation of bees to its spread and control (pp. 61-63); and the bearing of these facts for Idaho and the future (pp. 63, 64). A bibliography of 62 titles is appended.

The hornet in Fiji (Polistes hebraeus), R. VEITCH (*Colon. Sugar Refin. Co. [Fiji], Agr. Rpt.* 2 (1917), pp. 16, pl. 1).—This wasp, though generally considered an unmitigated nuisance, has been found to be beneficial in some districts, due to its predacious habits.

The turnip sawfly (Athalia flacca), R. W. JACK (*Rhodesia Agr. Jour.*, 14 (1917), No. 2, pp. 206-212, pls. 2).—A summarized account of this pest, which is one of the most important enemies of cruciferous crops in Rhodesia.

Laboratory rearing of and temperature experiments with the egg parasites, Trichogramma semblidis and T. fasciatum, S. A. MOKRZHETSKII (MOKRZETSKI) (*O Laboratornom Razvedenii Iaitsefedor Trichogramma semblidis i T. fasciatum i Temperaturnye Opyty Nad Nimi. Simferopol: Salgir. Opytn. Plod. Sta.*, 1916, pp. 13, figs. 4; *abs. in Rev. Appl. Ent., Ser. A*, 5 (1917), No. 4, pp. 155, 156).—Experiments conducted indicate that it is practical to rear these parasites artificially in any numbers and to keep them for many months, though further experiments are required to demonstrate how far they can be utilized for the practical control of the codling moth.

Descriptions of thirty-one new species of Hymenoptera, S. A. ROHWER (*Proc. U. S. Nat. Mus.*, 53 (1917), pp. 151-176).—Many of the 31 species here described as new, representing the superfamilies Tenthredinoidea, Ichneumoidea, Serphoidea, Chalcidoidea, and Sphecoidea, are of economic importance as parasites of forest insects. Among these are *Pristaulacus strangalia*, a parasite of *Strangalia luteicornis* in *Carpinus caroliniana* at Charter Oak, Pa.; *Odontomerus strangalia*, parasitic on *S. luteicornis* breeding in grape at Ballston, Va.; *Pyracmon conocola*, parasitic on *Pinipestis* sp., living in the cones of *Pinus coulteri*, and probably a parasite of *Evetria taxifoliella* in cones of *Psuedotsuga taxifolia*, at Coolestin, Oreg., and Julian, Cal.; *Angitia timeavora*, para-

ic on tined moths infesting the fruit body of *Polyporus dryophilus* at Mistie-
s, Oreg.; *Meloboris laspeyresiae*, parasitic on *Laspeyresia toruta* living in
cones of *Pinus ponderosa* at Talent, Oreg.; *Phadroctonus argyresthia*, parasitic
on a species of *Argyresthia* living on *Libocedrus decurrentis* at Ashland, Oreg.;
iospilus neodolus, a parasite of *Neodolus capre* breeding in *Quercus gambellii*
collected in North Cheyenne Canon, Colorado; *Phanerotoma erythrocephala*, a
parasite of *L. toruta* in the cones of *P. ponderosa* at Glenwood Springs, Colo.;
and *Odontobracon omeovorus*, parasitic on *Oeme rigida* at Apalachicola, Fla.,
and Morgan City, La.

Descriptions of some new parasitic Hymenoptera, A. B. GAHAN (*Proc.
U. S. Nat. Mus.*, 53 (1917), pp. 195-217).—This paper contains descriptions of
two genera, 25 species, and one variety new to science, of which each species
described from reared material, thus connecting it with a definite host record.
The species thus described are *Ephedrus nitidus* from the cabbage aphid at
New Brunswick, N. J.; *Microbracon sanninoidea* from the peach borer at College
Park, Md.; *Microgaster epagoge* from *Epagoge sulfureana* at Nashville, Tenn.;
paniclea diacrisia from *Diacrisia virginica*, Washington, D. C.; *Chelonus*
lithorinaceae from the potato tuber worm at Rocky Ford, Colo.; *Phancrotoma*
ranklini from the cranberry fruit worm at East Wareham, Mass.; *Opius pegomya*
from *Pegomyia vicina* at Oxnard, Cal.; *O. coriaceus* from *Ceradontha*
arvensis at Greenwood, Miss.; *O. otiosus* from *Agromyza parvicornis* at Browns-
ville, Tex.; *Neopius carinaticeps* n. g. and n. sp., reared from an *Agromyza* mine
in Hordeum at Wimbledon, N. Dak.; *Rogas perplexus* from *Peridroma marya-*
titosa at Tempe, Ariz.; *R. politiceps* from *P. incisus* at Nashville, Tenn.; *R.*
ufocozalis from *Autographa brassicae* and *P. margaritosa* at Rocky Ford, Colo.;
Cepiera benevola fuscifemora from the potato tuber worm at Pasadena, Cal.;
Liodontomerus secundus and *L. insuetus* from the clover seed chalcid fly at
 Caldwell, Idaho, and Tempe, Ariz., respectively; *Systellogaster ovivora* n. g.
and n. sp., from *Blatta orientalis* at Urbana, Ill.; *Pteromalus hemileuca* from
Hemileuca olivacea at Maxwell, N. Mex.; *Eupteromalus tachinae* reared from the
puparium of a tachinid parasite of *Leucania unipuncta*, probably *Archyles*
unialis, at Nashville, Tenn., and from *L. unipuncta* at Guelph, Canada; *Eutelus*
bruchophagi reared from the clover seed chalcid fly at Nephi, Utah; *Chryso-*
pharus mallochii from *Agromyza fetti* at Parker, Ill.; *Derostenus pallipes* from
Phytomyza aquilegiae at College Park, Md.; *Tetrastichus ainsliei* from *Mordel-*
istena sp., at Elk Point, S. Dak.; *T. dolosus* from *Euplectrus platyhypenae* and
E. comstocki at Tallulah, La.; *Notanisomorpha meromyzae* from *Meromyza*
americana at La Fayette, Ind.; and *Polymecus lasiopterae* from *Lastoptera* sp.,
at Elk Point, S. Dak.

Infection tests of a fungus parasite of insects, *Metarrhizium anisopliae*,
A. A. L. RUTGERS (*Dept. Landb., Nijv en Handel [Dutch East Indies], Meded.
Lab. Plantenziekten*, No. 25 (1916), pp. 9).—The details of infection experi-
ments with the green muscardine fungus on the larvae of *Leucopholis rorida*
and *Cyrtacanthacris nigricornis* are reported, largely in tabular form.

FOODS—HUMAN NUTRITION.

Possibilities of food from fish, H. F. TAYLOR (*U. S. Dept. Com., Bur. Fish-*
eries Econ. Circ. 30 (1917), pp. 4).—A brief summary.

The carp: A valuable food resource (*U. S. Dept. Com., Bur. Fisheries Econ.
Circ.* 31 (1917), pp. 7, fig. 1).—This includes data on the nutritive value of
carp and recipes for its preparation.

Why and how to use salt and smoked fish.—Sixty-one ways of cooking
them, H. F. MOORE (*U. S. Dept. Com., Bur. Fisheries Econ. Circ.* 29 (1917),
pp. 8).—A brief discussion and recipes.

The examination of canned salmon for bacteria and tin, L. D. BURNETT and C. A. A. UTT (*Jour. Indus. and Engin. Chem.*, 9 (1917), No. 7, pp. 674-679).—Forty-four samples from 26 concerns were examined and found to be sterile. Of the 20 samples analyzed for tin, all were found to contain less than 50 mg., which is well below the tolerance of 300 mg.

Nutrition investigations upon cottonseed meal, II, ANNA E. RICHARDSON and HELEN S. GREEN (*Jour. Biol. Chem.*, 30 (1917), No. 2, pp. 243-253, *figs. 13*).—A continuation of work upon cottonseed meal as a food for human consumption (*E. S. R.*, 35, p. 489).

It was found that with 50 per cent of cottonseed meal in the diet albino rats lived for from 400 to 565 days. With the addition of protein-free milk and milk fat the ration was sufficient for normal growth and reproduction to the third generation. This did not result with a 50 per cent cottonseed flour with a lack of protein-free milk and milk fat. In the former case, while there was no better growth, reproduction was increased and mortality lowered by the addition of 5 per cent of casein. When additional mineral matter was supplied, conditions in the second generation seemed still better.

No toxic effect was apparent from 45 to 50 per cent of cottonseed flour in the ration through four generations or during 565 days of the life of an individual. Petroleum ether extract of cotton seed in a well-balanced ration had a depressing effect on weight. Ethyl ether extract from petroleum-ether-extracted cotton seed and ethyl ether extract from Allison cottonseed flour showed no harmful effects.

The possibility of typhoid infection through vegetables, C. O. MILLICK (*Jour. Infect. Diseases*, 21 (1917), No. 1, pp. 28-38).—It was found that the longevity of *Bacillus typhosus* depends on the strain and the soil, varying from 29 to 53 days. Under natural conditions radishes grown in contaminated soil were infected after periods of 23, 35, and 37 days, and lettuce after 21 days. No evidence was found that the organisms entered the interior of the plants, but organisms attached to the surfaces were not removed by ordinary washing.

Fresh fruits and vegetables as conservers of other staple foods, CAROLINE L. HUNT (*U. S. Dept. Agr., Farmers' Bul. 871* (1917), pp. 11).—The place of fruits and vegetables in the diet in general is discussed, and specific directions given for the use of green peas and beans in place of meat, potatoes in place of cereals, and fruit to save sugar. A model menu and various recipes are included.

Microscopical studies on tomato products, B. J. HOWARD and C. H. STEPHENSON (*U. S. Dept. Agr. Bul. 531* (1917), pp. 24, *figs. 5*).—Microanalyses of a considerable number of tomato products indicated that such products when made from stock judged acceptable by visual inspection, do not show high counts of microorganisms. High counts indicate that the stock was in bad condition or handled in an insanitary manner. Pulp stored in barrels gave high counts.

The field work done indicates that stock should not contain over 1 per cent of decayed material and have a spore count of less than 20. A bacterial count of 15,000,000 indicates little as to the amount of decay, but beyond this point up to 20 per cent of rot each 20,000,000 means an increase of about 1 per cent of rot. High counts in tomato pastes and sauces indicate bad stock or insanitary handling.

The method used for the microanalysis of tomato products is included.

Maine packed blueberries, corn, and sardines, C. D. WOODS and A. M. G. SOULE (*Maine Sta. Off. Insp.*, 83 (1917), pp. 37-52).—This includes, among other data, tables giving the amount of water in different brands of canned blueberries and corn and the condition of canned sardines.

Food plants and textiles of ancient America, W. E. SAFFORD (*Proc. 2. Pan Amer. Sci. Congr. 1915-16*, vol. 1, pp. 146-153, pl. 1, figs. 4).—The paper gives an account of the principal food and textile plants of the Americas and their use by the prehistoric inhabitants. It includes, among other plants, maize, beans, peanuts and other legumes, squashes, pumpkins, various roots and tubers, coca, chocolate, tea, and cotton.

[Food and its conservation in North Dakota], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 4 [1917], No. 15, pp. 379-394).—This number contains analyses of various food and drug products together with a discussion of war bread and various other food conservation topics.

Ten lessons on food conservation (*Washington: U. S. Food Admin.*, 1917, p. 64).—There is included, along with suggestions on conservation, a lesson on the fundamentals of an adequate diet and the practical application of the acts of nutrition.

The eat-less-meat book.—(War ration housekeeping), MRS. C. S. PEEL (*London and New York: John Lane Co.*, 1917, pp. 207).—War ration housekeeping in England is discussed, including a popular summary of food values and menus. A large part of the book is taken up with recipes using little meat.

Bibliography of school lunches, compiled by LUCY CONDELL (*U. S. Bur. of Ed. Circ.*, 1917, pp. 25).—Some 150 titles are included.

The effect on human milk production of diets containing various forms and quantities of protein, B. R. MOOBLER (*Amer. Jour. Diseases Children*, 14 [1917], No. 2, pp. 105-112).—The author concludes that a nutritive ratio of 1 part digestible protein to 6 parts digestible fat and carbohydrate seems best adapted to the needs of nursing mothers. Animal protein is deemed more suitable than vegetable protein in supplying nitrogen and maintaining the nitrogen balance. The protein from nuts, when fed with other vegetable protein, is also adequate.

"A diet composed exclusively of cereals, fruits, and vegetables does not supply sufficient protein for elaborating milk protein and causes a severe drain on the tissues of mother."

"Of the various forms of animal protein, that which is derived from cow's milk seems particularly suitable for the production of human milk protein, as well as for the preservation of maternal tissues."

The effect of the emotions on the catalase content of the liver, W. E. and L. BUNK (*Amer. Jour. Physiol.*, 44 [1917], No. 1, pp. 75-79).—Experimental work on cats and dogs gives evidence that the fighting emotions and probably exercise increase greatly the catalase content of the liver. This catalase is given off to the blood and carried to the tissues, presumably to cause increased oxidation.

ANIMAL PRODUCTION.

Palm-kernel cake, C. CROWTHER (*Jour. Ed. Agr. [London]*, 23 [1916], No. 8, pp. 74-749).—Studies by the University of Leeds are reported.

On the question of palatability, reported by H. J. HARGRAVES, there was varying difficulty at first to get cattle to eat palm-nut meal or cake, and a uniform difficulty with sheep. This was not found to be due to flavor or aroma, as usually believed, but to a grittiness present. Soaking or straining did not overcome the difficulty, but mixing with other feeds, as linseed cake, overcame the trouble in proportion to the admixture. The difficulty is deemed of no practical significance where the palm-kernel cake does not form over one-third or one-half of the total mixture.

Keeping qualities, reported by W. GODDEN, showed that in the laboratory and on the farm the palm-kernel cake compared favorably with six other

cakes. It showed no sign of deterioration not equally marked with the other cakes, except linseed cake and, possibly, soy cake.

Data on the digestibility of palm-kernel cake and extracted palm-kernel meal and undecorticated cottonseed cake are reported by H. E. Woodman, as obtained with two sheep. The differences of digestibility between the palm-kernel cake and meal were slight, but the palm-kernel meal may be regarded as worth 23 per cent more and the palm-kernel cake 35 per cent more than cottonseed cake.

In a study of the influence of palm-kernel cake upon the yield and composition of milk, reported by A. G. Ruston, five cows were fed on pasture. The results were variable. There was a gain in live weight of the animals while on cake, a favorable influence upon the production of milk fat, and a slight increase in the fat content of the milk.

In a report of the influence upon the composition of the milk fat, made by H. Woodhouse, the results of analyses are shown indicating the passage of some ingredient of the palm-kernel oil into the milk fat. This renders probable the conclusion that the effects upon the output can be attributed thereto.

Feeding stuffs of minor importance, F. W. WOLL (*California Sta. Circ. 16; (1917), pp. 7*).—The object of this circular is to describe briefly some materials which, while not generally used, may be employed as feeding stuffs, because of the scarcity and high prices prevailing for hay and other common feeding stuffs. The following are discussed: Cereal straw, rice straw, legume straw, foxtail, Indian-corn stalks, stalks of grain sorghums, cannery refuse, sugar-beet tops and leaves, cull potatoes, potato tops, orchard products, acorns, and spineless cactus.

Utilization of farm wastes in feeding live stock, S. H. RAY (*U. S. Dept. Agr., Farmers' Bul. 873 (1917), pp. 12*).—The need of a more efficient use of straw, corn stover, and cottonseed meal is pointed out, and rations containing these products are listed for cattle, sheep, and horses.

Animal industry: The problems confronting it during and after the war, C. PUCCI (*Bol. Quind. Soc. Agr. Ital., 22 (1917), No. 7-8, pp. 172-182*).—A paper and discussion relating to the industry in Italy. A better utilization of fodders, by-products, etc., is advocated, and closer organization of those engaged in live-stock production is urged as a means of bettering present conditions and solving the problems that will arise after the war.

The sheep industry on the Minidoka reclamation project, E. F. RINEHART (*U. S. Dept. Agr. Bul. 573 (1917), pp. 28, figs. 7*).—This report treats briefly of the agricultural conditions on this reclamation project and in detail of the history and present status of the sheep industry, methods of sheep management, and the future development of the industry. The suggestions made in this bulletin, while based primarily on the results of observations on the Minidoka reclamation project, are deemed applicable to several other irrigation projects in the northwestern United States having similar climatic and agricultural conditions.

Ration experiments with swine, A. D. FAVILLE (*Wyoming Sta. Bul. 114 (1917), pp. 8*).—Fifteen pigs averaging 87 lbs. each were divided into three lots and fed as follows: Lot 1, ground barley; lot 2, ground barley and meat meal 9:1; and lot 3, ground rye. The grains were valued at \$25 per ton, the meat meal at \$55. The pigs were bought at \$7 per hundredweight and sold for \$9.40. They were fed in the experiment for 70 days.

Lot 1 made an average daily gain of 1.46 lbs., requiring 4.13 lbs. of feed per pound of gain and costing 5.16 cts. Lot 2 gained 1.74 lbs. daily with 3.33 lbs. feed per pound of gain, costing 5.18 cts. Lot 3 gained 1.53 lbs. daily with 3.48 lbs. feed per pound of gain, costing 4.35 cts.

During the first six weeks the grains were mixed with water and fed immediately, while for the last four weeks they were soaked from one feeding to another. The soaking apparently increased the grain consumed and the gains made, but without materially changing the amount of feed per pound of gain.

An analysis of the grains, which were grown locally, is appended.

[Pasturing alfalfa, corn, and rape with hogs], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 10, 11, fig. 1*).—continuation of work previously reported (*E. S. R.*, 36, p. 171) on a six-year station in which third-year alfalfa and corn were harvested by pigs. One lot of five pigs with an initial weight equivalent to 2,096 lbs. per acre, was pastured from May 1 to July 15, 1916, and a second lot of eight pigs with a weight equivalent to 1,424 lbs. per acre was pastured from July 15 to September 23, 1916. In addition the pigs were fed 2 lbs. of corn per day per 100 lbs. live weight.

During the two periods 758 lbs. of pork was produced. The corn consumed during the season amounted to 1,750 lbs. and the return from the alfalfa crop \$124.72 per acre.

Four of the pigs used in the second period of the alfalfa-pasturing experiment were transferred to a corn plot September 23. In 20 days they gained 168 lbs., with a net return of \$47.04 per acre for the corn.

On two corn plots rape was sown between the rows on August 1, but made little growth. Four pigs were put on these plots September 23, and in 38 days they had cleaned up the plots. Gains were made at the rate of 586 lbs. per acre, and returned 81 cts. per bushel for the corn.

Swine management, G. M. ROMMEL and F. G. ASHBROOK (*U. S. Dept. Agr., Farmers' Bul. 874 (1917), pp. 38, figs. 16*).—This is a revision of Farmers' Bulletin 205 (*E. S. R.*, 16, p. 400). The industry is treated under the following heads: The merits of the hog, hog-growing sections of the United States, location of farm for hog raising, number of hogs for a farm, the foundation herd, feeding and management, sanitation in the hog lot, prevention of disease, treatment of disease, destruction of vermin, and intestinal worms.

The present position and future prospects of swine breeding in Denmark, A. MÖRKENGAARD (*Tidskr. Landökonomi, 1916, Nos. 5, pp. 235-269; 6, pp. 324-348; Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1916), No. 1, pp. 40-56*).—his article, based upon a lecture delivered before the Royal Danish Agricultural Society, describes the history, development, and future prospects of swine breeding in Denmark.

The plan of organization and operation of breeding centers is explained, and the method of testing the offspring of the stud animals in the breeding centers is outlined. An average of two pigs from each selected sow is sent annually to the experiment stations. From the performance of these pigs data are obtained as to age at which killing weight is reached, feed units required to produce a given weight, and quality of the bacon. The results are made the basis of selection of stud animals, those being preferred whose descendants have shown the highest degree of thriftiness and growth energy, and have produced the best bacon.

It is stated that this plan has been most valuable in improving both the Danish and Yorkshire breeds of swine, the two bacon breeds of Denmark.

Feeding horses, C. N. ARNETT (*Montana Sta. Circ. 65 (1917), pp. 73-82*).—discussion of feeds and the feeding of horses, with special reference to Montana conditions.

Artificial insemination, E. H. RILEY (*Montana Sta. Circ. 65 (1917), pp. 7-66, figs. 7*).—General directions are given for the artificial impregnation of mares.

On the life duration of the horse spermatozoon outside of the body, S. SATO (*Acta Scholae Med. Univ. Imp. Kioto*, 1 (1916), No. 3, pp. 361-374; *abs. in Jour. Roy. Micros. Soc.*, No. 4 (1917), p. 381).—The author has observed the duration of life of horse spermatozoa in 1.1 NaCl solution (up to 10 hours, rarely 24), and in from 5.2 to 5.25 per cent dextrose solution (from 10 to 30 hours, rarely 70). Suitable conditions are an alkalinity corresponding to 0.001 per cent KOH, an osmotic pressure equal to 5.24 per cent dextrose, a temperature of from 13 to 15° C., one atmospheric pressure, and a percentage of oxygen much less than that in air.

The numerical law of the regression of erectile organs, following castration of adult Gallinaceae, A. PÉZARD (*Compt. Rend. Acad. Sci. [Paris]*, 164 (1917), No. 19, pp. 734-736, figs. 4).—In a study of the effect of postpuberal castration on the regression of erectile organs (combs, wattles, and ear lobes) in cocks, the author has measured the diminution of length of comb following castration of four birds. Three of these were completely castrated and the fourth was a capon in which the development of the comb was obtained by the injection of testicular extract and the regression of the organ was produced by the cessation of the injections. It was found that the testicular hormone is necessary for the development and maintenance of erectile tissue. Furthermore, the action of this hormone must be constant.

Gonadectomy in relation to the secondary sexual characters of some domestic birds, H. D. GOODALE (*Carnegie Inst. Washington Pub.* 243 (1916), pp. 52, pls. 7, fig. 1; *abs. in Jour. Roy. Micros. Soc.*, No. 1 (1917), pp. 106, 107).—Experiments were conducted with Rouen ducks, Brown Leghorn fowls, and cross-bred birds, observing the changes in plumage, etc., that follow gonadectomy.

The plumage of the orchidotomized male was altered comparatively little. Some feathers grew somewhat longer, but otherwise they were the same as in the unaltered male. In contrast, the plumage changes of the ovariectomized female were extensive, in respect to shape, size, color, and color pattern. The plumage approximated that of the normal male.

The capon's comb and wattles remained of infantile type. In the castrated hens the comb became very large and malelike in some, while in others it remained comparatively small.

All the capons reported on had well-developed spurs. In all the castrated hens in which the male plumage also developed there were well-developed spurs, while in many of those in which the assumption of male plumage was partial or temporary the spurs started to grow. Apparently the dependence of the spurs upon the internal secretion is relatively slight. The inhibition exerted in the female upon the development of the spurs is so slight that once development starts the hormone is not always able to check it.

In the cases reported on, castration with one exception, has not influenced the molt of the capon. On the other hand, castrated ducks lose the power of developing the summer plumage. Castration is without influence on the color of the male duck's mandible, but ovariectomy results in the disappearance of certain pigments from the mandible of the female. Completely castrated individuals of all kinds are on the whole negative in behavior as compared with normal adults.

Male characters, such as spurs, large comb and wattles, and a "neck ring" in ducks, sometimes occur in otherwise normal females. Instances of the occurrence of female characters in males, strictly comparable to those just referred to, are uncommon or wholly lacking. The only character of this sort among capons is the brooding instinct. Some femalelike characters in males are juvenile characters. Neither the assumption of male plumage by the female nor the development of the accessory reproductive organs need be considered at-

hence that the female is a suppressed hermaphrodite, because the secretion of the ovary clearly controls their development. On the other hand, it is clearly proved that the female is a suppressed pseudohermaphrodite. On the whole, the relation between the gonads and the secondary sex characters appears to be specific and not general.

The three most important results are as follows: (1) If the ovary of a domestic bird be removed completely, many of the secondary sex characters of the male appear (and always of the male of the same race). Some individuals become nearly complete replicas of the male, others imperfect imitations of the male. (2) If the testes be removed, the majority of the secondary sex characters of the male develop, though a few may remain in an infantile condition. (3) Castrated drakes lose the power of developing the summer plumage.

Contribution to the history of the development of the exterior attributes of the male sex in female birds, O. LARCHER (*Rec. Méd. Vét.*, 91 (1916), No. 11-12, pp. 173-183).—This is a historical summary of the literature pertaining to this subject, including an extensive bibliography.

Some observations on the origin of melanin pigment in feather germs from the Plymouth Rock and Brown Leghorn fowls, R. M. STANGE and KATHERINE KNOWLTON (*Anat. Rec.*, 13 (1917), No. 2, pp. 97-108, figs. 6).—A study was made of the melanin pigment in feather germs pulled from the back, breast, neck, and wings of adult Plymouth Rock and Brown Leghorn male and female fowls.

Examination of sections cut from these feather germs showed that melanin pigment granules occur occasionally in the so-called cylinder and inner-sheath cells. Further evidence was obtained that the melanin pigment of feathers is epidermal in origin. Melanophores were found in the dermal pulp at the proximal end of feather germs. Some of these pulp melanophores have processes which are usually relatively short, but they do not appear to distribute pigment to other cells, and they have no part in the histogenesis of the feather or its pigment.

Inter-periodic correlation in the egg production of the domestic fowl, J. A. HARRIS, A. F. BLAKESLEE, and W. F. KIRKPATRICK (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 9, pp. 565-569, figs. 2).—This investigation deals with the correlations between the egg production of various periods in White Leghorn fowls.

The coefficients of correlation between the production of single months and the production of the remaining 11 months of the year range, in the cases observed, from 0.295 to 0.567 in the several months (November-October) of 1913-14 and from 0.24 to 0.567 in 1914-15. For purposes of prediction the correlation coefficients may be thrown into the form of linear regression equations, which have been found to give reasonably good fits to the empirical means for the annual egg records of birds laying various numbers of eggs in the individual months. The slope of the lines when plotted shows there is an increase of from 2.6 to 5 eggs in mean annual production associated with a variation of one egg in monthly record. Since in practical selection groups of birds differing by far more than a single egg may be recognized, the difference in annual production secured by selecting in any month may be of very practical importance, amounting to from 30 to 60 eggs per year.

Coefficients are also given showing the correlation between the annual total and the deviation of the monthly record from the value which it should have if variation in monthly production were directly proportional to variation in the annual production. Sets of correlations, 110 coefficients in all, have been worked out for the production of five of the individual months and the production of each of the other months of the contest year (November-October).

The months selected were November of the pullet year and the following October and the intervening months, January, April, and August. These 119 coefficients are without exception positive in sign. This indicates that if abnormally high laying at one period tends, as the result of nutritional or other physiological factors, to result in abnormally low production during a subsequent period, the reduction is not sufficient to outweigh the influence of the initial differentiation of the birds in their capacity for egg production suggested above.

Two laws are evident in these intermensual correlations: (1) The correlation between the egg production of the individual months tends to become smaller as the records upon which the correlations are based become more widely separated in time. (2) There is a more intimate correlation between the egg production of the autumn and winter months at the beginning and end of the contest year than between the egg production of these months and the productions of the intervening spring and summer months.

The cycles and rhythm of egg production, C. T. PATTERSON (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husband.*, 3 (1916), Nos. 2, p. 16; 3, p. 20).—A discussion of the cycles and rhythm of egg production as a basis for selection of high egg producers. The term cycle is used by the author to mean the number of eggs the hen lays without missing a day. The rhythm of egg production means the recurrence of the cycle. In selection experiments with several hundred hens, in connection with the egg-laying competition at the Missouri Poultry Station, those having a cycle of 4 eggs or more during March averaged 150 eggs in the year, and all which had a cycle of 2 eggs or less averaged 110 eggs each.

The hen's annual vacation, G. M. ROMMEL (*Jour. Heredity*, 8 (1917), No. 3, pp. 132-142, figs. 11).—The author discusses the natural causes of a scarcity of eggs in winter and suggests simple rules for increasing fall and winter egg production. Briefly these are (1) hatch chickens early—between March 1 and April 30, (2) develop the pullets properly, and (3) furnish good quarters for the following winter. Feed liberally when laying begins.

Fourth Irish egg-laying competition (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 17 (1916), No. 1, pp. 88-109).—A detailed account is given of the fourth Irish egg-laying contest held at the Munster Institute, Cork, from October 1, 1915, to August 31, 1916.

Fourth Irish egg-laying competition, 1915-16.—Supplementary report on the noncompeting pens, with some notes on the breeding of Rhode Island Reds for egg production, Miss L. MURPHY (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 17 (1917), No. 2, pp. 280-289).—A report is given of the performance of the noncompeting pens in the egg-laying contest noted above, together with some notes on the breeding of Rhode Island Reds for egg production.

The breeding experiment was started in 1909 with 10 Rhode Island Red pullets which were mated to a male bird, hatched from eggs imported from America. The average egg production of the 10 birds during their pullet year was 129 eggs. In 1911, 10 of the best pullets that had been raised from the above mating were mated to a male bird that was selected on the factor of vigor. These 10 pullets averaged 139 eggs each in their pullet year. One of the pullets laid over 200 eggs and made a high winter record. Her eggs were large, thick in shell, and of good color. From this hen and the above male 8 pullets were reared in 1912. These 8 pullets averaged 214.5 eggs each during their pullet year. From a half sister of the above hen mated with the same male 8 pullets were raised that averaged 221 eggs each for 12 months. These birds have become the foundation of a valuable line.

In breeding for increased size of egg it was found that whenever a hen laying a first grade egg (2 oz. and upwards) was mated to a male bird, the

son of a similar hen, the pullet offspring invariably laid eggs of first grade. Small eggs were not always coupled with heavy production.

In grading up flocks at the Munster Institute all birds have been weeded out that failed to lay 80 eggs during the three winter months, and the best pens are made up of hens that have a winter egg record of 40 eggs. To learn the effect of mating the son of a good layer to a pen of birds with poor egg records a cockerel from a 200-egg hen was mated to 6 hens with an average record of 95 eggs for 11 months. Twelve pullets saved from this mating averaged 127 eggs each for 11 months. It is stated that for the specialist breeder accurate trap-nest records and the most vigorous culling are essentials to success. "The number of eggs laid during the winter period, the size of egg, the substance of the shell, the suitability of the eggs for hatching, the ease with which chickens can be reared, and the rate of growth of young birds have all to be taken into consideration. If the hen falls seriously in any one of these points, she is unfit for the breeding pen no matter what her egg record may be."

Final report on egg-laying competition, Queensland Agricultural College, April, 1916, to March, 1917 (*Queensland Agr. Jour.*, n. ser., 7 (1917), No. 5, pp. 222-229).—A detailed account is given of the thirteenth egg-laying competition at the Queensland Agricultural College.

In all, 438 birds were subjected to the year's test, 318 in groups of six, while 120 were tested individually. It is stated that group testing has to a great extent served its purpose, and that single-pen tests will be substituted for the group tests in the future as rapidly as funds become available for the reconstruction of yards and houses.

Origin of the sex cords and definitive spermatogonia in the male chick, C. H. SWIFT (*Amer. Jour. Anat.*, 20 (1916), No. 3, pp. 375-410, figs. 6; *abstr. in Jour. Roy. Microsc. Soc.*, No. 1 (1917), p. 109).—The true sex cords or seminiferous cords originate from the germinal epithelium during the sixth and seventh days of development, and are the result of localized activity of the epithelium. Nearly all the primordial germ cells present in the germinal epithelium are carried down into the seminiferous cords, but they play only a passive rôle, for at this time they show no evidences of cell division. The sex cords remain attached to the germinal epithelium for only a short time, and continue to grow, after formation of the albuginea, as a result of division of the peritoneal cells. At the end of the seventh day of development the sex of the individual can be easily told, for in the male the gonads are of nearly equal size, while in the female the left gonad is much the larger.

Cavities begin to appear in the network of seminiferous cords during the twentieth day, arising by liquefaction of axial cells. At this date the spermatogonia are found against the basement membrane, with the nucleus toward the central axis of the cord, and the mitochondrial crescent near the basement membrane. They probably reach this position by amoeboid migration. The elongated cells between the spermatogonia are derived from the peritoneal cells of the seminiferous cords. The primordial germ cells give rise to the spermatogonia, and the coelomic cells of the germinal epithelium produce the supporting cells of the seminiferous tubule.

New Jersey poultry survey, A. G. WALLER (*New Jersey Stas., Hints to Poultrymen*, 6 (1917), No. 1, pp. 4).—Data as to receipts and expenses on 150 poultry farms in Vineland, Lakewood, and Sussex Counties for the year ended November 1, 1916, are reported. The average number of birds was 787 and the labor income \$730.

Poultry keeping in town and country, F. C. ELFORD (*Canada Dept. Agr., Poultry Div. Bul.* 89 (1917), pp. 47, figs. 66).—This is a treatise on the industry in a general way, written in popular style for general distribution. The various

phases of poultry rearing are treated with a view of teaching better methods and of arousing and stimulating interest in the industry.

The guinea fowl, A. S. WELANT (*U. S. Dept. Agr., Farmers' Bul. 858 (1917), pp. 15, figs. 5*).—Practical instructions in breeding, feeding, and marketing the guinea fowl.

The progress of ostrich raising in Morocco, AUBAY (*Rec. Méd. Vét., 92 (1916), No. 21, pp. 622-634, figs. 9*).—Trials at Mekines which give promise of success are reported. Artificial incubation is found preferable to natural.

The rabbit industry, L. BÉZCHEMIN (*L'Élevage Moderne et L'Industrie du Lapin. Paris: Libr. Agr. Maison Rustique, [1918], pp. [4]+188, figs. 42*).—Data are given on origin, breeds and breeding, diseases, and the manufacture of the skins.

DAIRY FARMING—DAIRYING.

Trials with California silage crops for dairy cows, F. W. WOLL and E. C. VOORHIES (*California Sta. Bul. 282 (1917), pp. 19-40*).—Experiments with silage crops conducted at the university farm during the past four years have shown that average yields of from 10 to 15 tons of green forage may be secured on grain land receiving one irrigation, in the case of corn, sweet sorghum, milo maize, feterita, and Sudan grass. When cut at the right time (about time of maturity for corn, and when fully matured for the other crops), and carefully packed in the silo, all these crops produce silage of excellent quality and palatability and furnish succulent feed of special value for feeding dairy and beef cattle, as well as sheep, during late summer or the winter season.

In a feeding experiment comparing alfalfa hay as a sole roughage with alfalfa hay and corn silage for milch cows, two lots of 13 cows each were fed for three periods of 4 weeks each. Lot 1 was fed alfalfa hay and corn silage throughout the test and lot 2 alfalfa and corn silage during the first and third periods and alfalfa hay as a sole roughage during the second period. In addition, 8 of the cows in each lot were fed a grain mixture of approximately equal parts by weight of wheat bran, rolled barley, and oats, and small amounts of linseed meal and coconut meal. The other cows received only the rough feeds. The production of lot 2 showed an average increase of 2.7 lbs. milk and 0.1 lb. milk fat per head daily on alfalfa hay and silage as compared with alfalfa hay as a sole roughage. For both the lots it is estimated that the milk and butter production was increased 14 per cent by the use of silage. Comparing the production of the 10 cows in this test which were fed alfalfa hay alone with that of the 16 cows fed alfalfa hay and grain, it is noted that where the cows were fed grain there was an increase of from 1 to 3 per cent in milk and milk components when silage was fed. On the other hand, the cows fed no grain showed an increase of from 26 to 27 per cent in milk and butter production due to the feeding of silage. The nutritive ratio for the rations fed lot 2 was 1:5.3 during the silage periods and 1:3.9 during the no-silage period. Apparently the efficiency of the rations was from 11 to 12 per cent greater during the silage periods than during the no-silage period.

In order to test the value of milo maize silage as a supplement to alfalfa hay 18 cows were fed during three periods of 4 weeks each as follows: First and third periods, milo maize and alfalfa hay; second period, alfalfa hay. In addition 10 of the cows were fed from 3 to 6 lbs. per head daily of a mixture of rolled barley, coconut meal, and dried beet pulp (1:2:1). The average milk yield was slightly lower on the silage rations than on the dry feed only, but the quality of the milk produced on the former rations was somewhat better than that on the latter, making the average production of fat and other milk

solids practically the same for the two kinds of rations. The milk and fat production per 100 lbs. of dry matter in the rations was from 5 to 8 per cent higher on the silage rations than on the dry roughage ration.

Experiments were also conducted to furnish information regarding the comparative value for milk production of corn silage and silage made from Sudan grass or sweet sorghum. In comparing Sudan grass silage and corn silage 21 cows were fed three periods of 4 weeks each on alfalfa hay and a grain mixture of dried beet pulp, coconut meal, wheat bran, and rolled barley (4:1:1:1), and in addition corn silage during the first and third periods and Sudan grass silage during the second period. During the corn-silage periods there was slightly larger production than during the Sudan grass silage period. On the basis of dry matter content of the rations the corn silage rations were about 10 per cent more efficient than the Sudan grass silage.

In a further test 28 cows were fed as in the above experiment except that sweet sorghum silage was fed instead of Sudan grass silage. In this test all but 3 cows received concentrates in addition to alfalfa hay and silage. Only insignificant differences in the effect of the two silage rations on the production of the cows were found. When compared on the basis of dry matter content the sweet sorghum silage rations were about 5 per cent more efficient than the corn silage rations.

Results of analyses of the feeds used in these tests are tabulated.

[Tests of irrigated pastures], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1916, pp. 14-16, fig. 1*).—A test of the carrying capacity of pastures, previously reported (*E. S. R., 36, p. 173*), was continued. Two grade Jersey cows were pastured from May 8 to October 1, 1916, or 146 days, on a pasture of mixed grasses, supplemented at times with alfalfa hay. During the period the cows produced 145 lbs. of milk fat, and gave a net return of \$49.76 per acre for the pasture.

In a preference test of individual grasses, several plots of grasses were thrown into one inclosure and pastured by a cow. She showed a decided preference for white clover and brome grass. After grazing these plots rather closely preference was shown for the remainder of the grasses in the following order: Meadow fescue, orchard grass, tall fescue, and perennial rye grass.

Notes on pasturing a helper and sheep are included.

Report of progress on animal husbandry investigations in 1916, R. PEARL (*Moine Sta. Bul. 261 (1917), pp. 121-144*).—Progress reports are made on the following lines of work:

Cooperative breeding records.—For the purpose of this study about 200 of the leading breeders of cattle in Maine, and a few outside of the State, are contributing exact records of the breeding operations in their herds. From data thus furnished and here tabulated, including 3,085 cows and helpers and 217 bulls in 192 herds, it appears that the great majority of this group of breeders attempt to follow some definite rule in regard to the time of the heat period at which the cow shall be served, ostensibly for the purpose of control of the sex of the offspring. About 42 per cent of these breeders think that early service is most likely to get helper calves, while about 27 per cent think that service late in heat and 3.1 per cent think that when cows are bred in the middle of heat this end is obtained. An examination of the actual times of breeding, however, shows that these 192 breeders are having more of their cows served in the mid-estral period than either very early or very late.

Physiology of reproduction.—It is noted that the station will soon issue a bulletin on this subject, with special reference to the breeding of dairy cattle.

The control of the sex ratio.—From a study of statistics which it is stated are soon to be published, it appears that there is no definite or permanent rela-

tion between the time in the heat period at which the cow is served and the sex of the offspring. Tabulated results of 1,313 matings show that of the calves resulting from service under three hours after appearance of heat 51 per cent were bulls, of calves resulting from service over three hours and under eight hours 51.7 per cent were bulls, and 46.9 per cent of the calves were bulls when the cows were served over eight hours after the appearance of oestrus.

The analysis of milk records.—In continuation of this study (E. S. R., 37, p. 775), the effect of certain Advanced Registry Jersey bulls on the average milk, fat test, and net milk-fat production of their daughters as compared with the dams of these daughters is considered. From tabulated data of 23 well-known Jersey sires, it appears that about one-half of the bulls in this group got daughters which, on the average, were poorer producers than the dams of those daughters. In some cases the deleterious effect of the bull on the productive qualities of his offspring was extremely marked. On the other hand, certain of the bulls in this group exercised an extraordinarily beneficial effect upon the productive qualities of the breed.

New cooperative project.—An outline is given of a cooperative plan by which it is hoped to furnish to the dairy cattle breeders of the State definite and dependable information as to whether their bulls are transmitting productive qualities to their progeny.

Breeding experiments.—Notes are given on the progress being made in the attempt to build up an experimental herd of crosses between low-milking and high-milking breeds, and between low-testing and high-testing breeds of cattle.

Report of the second Jersey sires' futurity test of the Aroostook Jersey Breeders' Association.—A report is given of the second of these sires' futurity tests (E. S. R., 35, p. 70), which was held at the Aroostook farm in October, 1916.

The change of milk flow with age as determined from seven day records of Jersey cows, R. PEARL and S. W. PATTERSON (*Maine Sta. Bul.* 262 (1917), pp. 145-152, fig. 1).—Results are given of a study of the milk flow of Jersey cows as affected by age. The basis of the study was the seven-day milk records of 5,821 Jersey cows as published by the American Jersey Cattle Club.¹

It is concluded that milk production changes with age in a definite manner. This change follows a logarithmic curve of the form $y = a + bx^c + c \log x$ where y = production and x = age. Maximum production is reached at approximately the age of eight years and seven months.

The dairy record (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916, pp. 60-64, fig. 1*).—A progress report is given of an experiment in breeding up a herd of grade Guernseys from common and mixed-blood cows with pure-bred Guernsey bulls. In 1905, when the project was begun, the average milk fat production per cow was 196 lbs. In 1916 this production had increased to 300.7 lbs. The average milk production per cow of 41 cows in the herd in 1916 was 6,281 lbs. The average fat content of the milk increased from 4.27 per cent in 1911 to 4.78 per cent in 1916. Summarized herd records from 1911 to 1916, inclusive, and individual records for 1916 are tabulated.

Data on stump-land pasture emphasize the advisability of brushing and seeding down stump lands, as the net profit per acre from stump lands after being seeded down to grass for several years will almost equal the original cost of brushing and seeding, when grazed by dairy cows.

Raising dairy helpers (*Mo. Bul. Ohio Sta., 2 (1917), No. 3, pp. 291-298, fig. 2*).—On the basis of previously noted studies in Wisconsin, Connecticut, Massa-

¹Jersey Sires and Their Tested Daughters. Published by American Jersey Cattle Club, New York, 1909.

Amherst, and Ohio, and on data obtained on twelve Ohio farms, the attempt is made to estimate the cost of raising dairy heifers under present conditions. Tabulated data show the cost of raising heifers under various price schedules for feeds, etc. These data indicate that with the present prices of feed and labor it costs over \$100 to raise a heifer to two years of age.

The milk goat in California, E. C. VOORHIES (*California Sta. Bul. 285* (1917), pp. 87-114, figs. 13).—In addition to general information on the breeds of milk goats represented in California, composition and uses of goat's milk, immunity of goats to diseases, care and management of goats, and future prospects of the milk goat industry in the State, results are reported of experimental work with milk goats at the station, in part previously noted (E. S. R., 33, p. 173), but with data for three additional animals. The average feed cost for five does has been 6.4 cts. per gallon of milk as compared with 8.3 cts. for 73 cows.

The cost of distributing milk in six cities and towns of Massachusetts, A. E. CANCE and R. H. FERGUSON (*Massachusetts Sta. Bul. 173* (1917), pp. 54, pls. 5, figs. 4).—This investigation covers the cost of distributing milk in Amherst, Walpole, Haverhill, Pittsfield, Springfield, and Worcester. The work was done during the fall of 1914 and winter of 1915 by the Massachusetts Agricultural College in cooperation with the Bureau of Markets of the U. S. Department of Agriculture. Accounts and statements were obtained from 85 distributors, some of whom were producers and some dealers. Including labor, depreciation, maintenance, and overhead charges, it cost these distributors an average of 2.64 cts. per quart to distribute retail milk during the period under study.

An itemized summary is given of costs for 42 plants delivering milk to about 21,000 customers in Springfield and Worcester. For these 42 plants the average cost of processing and retailing milk was 2.79 cts. per quart for an average daily delivery of 175 qt. of retailed milk per horse the year round. Of this 2.79 cts. 5.69 per cent is charged to depreciation, 20.34 per cent to maintenance, 17.06 per cent to circulating capital, and 56.91 per cent to labor.

Classifying 80 of the plants included in this study by size and kind of business it is noted that for plants of from 500 to 1,000 qt. daily capacity the distribution costs were 1.64 cts. per quart for all deliveries, and 2.05 cts. per quart for retailed milk. For plants of from 1,000 to 2,000 qt. capacity these costs were 1.82 and 2.23 cts. per quart. The plants of less than 500 qt. daily capacity averaged 2.04 and 2.66 cts. per quart. The cost of retailing milk in the 3 plants doing a mixed business of more than 2,000 qt. daily was 2.92 cts. per quart, and in the 20 exclusively retail plants 2.93 cts. per quart.

Comparative costs by localities involved in this study are tabulated and discussed. A comparison was made of the business of four producers who distributed their own milk and of five dealers who bought all the milk they distributed. The average retailing cost of the producers was 2 cts. per quart against 2.16 cts. for the dealers. A striking feature of this comparison is the great difference in costs as between individuals, whether producers or dealers.

Brief studies are reported of the cost of delivery of special milk, cost of collection and distribution of wholesale milk in cans, cost of motor-truck delivery, and cost of distribution of cream. Significant facts of distribution showing individual variations, disadvantages in competitive distribution of milk, and suggestions for improving conditions are discussed.

A guide for formulating a milk ordinance (U. S. Dept. Agr. Bul. 585 (1917), pp. 4).—A form of milk ordinance is presented to assist the community in providing an instrument for bettering its milk supply. The ordinance is restricted to the production, handling, and sale of milk and cream as such,

and takes into consideration definitions, standards, grades, adulteration, the making of regulations, the collection of samples, and penalties. Notes are given on milk ordinances and on special features of the proposed form.

Cooperative creameries and cheese factories in Minnesota, 1914. E. D. DURAND and F. ROBOTKA (*Minnesota Sta. Bul. 166 (1917), pp. 53, figs. 7*).—A statistical study of the present status of cooperative creameries and cheese factories in Minnesota, with special emphasis on the relative importance of the cooperative and independent factories.

In 1914 there were 850 creameries in the State, of which 622 were cooperative. Of the noncooperative creameries 39 were centralizers and 189 local proprietary concerns. Of the 120,806,398 lbs. of creamery butter made during the year, 61.4 per cent was produced in cooperative creameries, 25.6 per cent in centralizers, and 13 per cent in local proprietary creameries. Over one-fifth of the total milk fat received by the cooperative creameries was obtained from whole milk, and these associations made the higher grade of butter.

Of the gross receipts the cooperative creameries paid their patrons 89.7 per cent, the proprietary creameries 87.9 per cent, and the centralizers 87 per cent. The cost of producing a pound of butter and the price paid for milk fat were somewhat higher for the cooperative creameries than for the others. The overrun varied from 20.8 per cent for the proprietary creameries to 22.5 per cent for the centralizers.

The cheese industry of the State is concentrated in a few small areas, considerably more than one-half of the cheese being made in Goodhue County. Of the 71 cheese factories in the State, 36 were cooperative, 31 were proprietary, and 4 were centralizers. The cooperative cheese factories confined themselves to the manufacture of Cheddar cheese. On the other hand, brick and Swiss cheeses were made only by proprietary factories. About three-fourths of the total cheese and four-fifths of the Cheddar cheese made in the State was made in cooperative factories. On the basis of Cheddar cheese the cooperative factories paid their patrons about 2 per cent more of the gross proceeds and 8 cts. more per 100 lbs. for milk, and received about 1 ct. more per pound for cheese than the proprietary factories.

The authors discuss the influence of the cooperative movement upon the dairy industry of the State, and methods of organizing cooperative creameries. The appendix gives the text of the Minnesota cooperative law and forms used in organizing cooperative creameries thereunder.

The manufacture of cottage cheese in creameries and milk plants. A. O. DAHLBERG (*U. S. Dept. Agr. Bul. 576 (1917), pp. 16, figs. 8*).—Full directions are given for the commercial manufacture of cottage cheese, including the importance of pasteurization, equipment required, yield, use of buttermilk, cost of manufacture, and markets and prices.

VETERINARY MEDICINE.

Report of the twentieth annual meeting of the United States Live Stock Sanitary Association (*Rpt. U. S. Live Stock Sanit. Assoc., 20 (1916), pp. 256, figs. 3*).—This report of the proceedings of the annual meeting held at Chicago, December 5 to 7, 1916, includes the following papers: Gangrenous Glossitis of Horses, by T. C. Teidebold, C. S. Mather, and L. A. Merillat (pp. 29-42); Review of Research Work on Hog Cholera, by M. Dorset (pp. 42-55); Regulations to Prevent Spread of Hog Cholera, by J. I. Gibson (pp. 55-58); Hog Cholera Control in Missouri, by D. F. Luckey (pp. 58, 59); Hog Cholera Control in Iowa, by J. S. Koen (pp. 59-76); Methods of Hog Cholera Control as Carried Out by the State Veterinarian of Indiana, by A. F. Nelson (pp.

6-78); Method of Control of Hog Cholera in Ohio, by A. S. Cooley (pp. 78-81); Methods of Hog Cholera Control in Massachusetts, by E. A. Cabili (pp. 82-86); Abortion Disease As It Affects the Animal Husbandry of the United States, by L. Eichhorn and G. M. Potter (pp. 88-93); Abortion in Dairy Cattle, by W. L. Williams (pp. 93-112) (E. S. R., 37, p. 482); Abortion and the Range Cattle Industry, by C. G. Lamb (pp. 112, 113); Possibilities and Limitations in Control of Abortion, by C. J. Marshall (pp. 113-117) (E. S. R., 38, p. 883); Practically Significant Facts about Abortion Disease, by E. C. Schroeder and W. E. Jottee (pp. 117-130); Desirability of Requiring Certificates of Health, Including Tuberculin Test Certificates for Cattle and Immunization Certificates or Swine Shown at Stock Shows, Live Stock Expositions, State and County Fairs, by H. E. Williams (pp. 130-132); How Should a Tuberculin Test be Applied to Insure Accuracy in Results? by J. G. Wills (pp. 132-137); The Nurse Cow a Factor in Tuberculosis of Registered Cattle, by A. T. Kinsley (pp. 137-143); Appointment and Organization of County Live Stock Sanitary Boards, by H. Groman (pp. 143-146); Organization and Personnel of State Live Stock Sanitary Boards, by C. E. Cotton (pp. 146-153); Desirability of Exempting Range Bred and Branded Cows and Heifers from State Regulations Governing Importation of Cattle for Breeding and Dairy Purposes, by F. S. Hastings (pp. 153-157); Regulations of Interstate Movement of Live Stock, by E. M. Ranck (pp. 157-162); Reasonable Regulations for Disinfecting Stock Cars, by M. S. Cohen (pp. 162-165); Cleaning and Disinfection of Stock Cars and Yards in Canada, by F. Torrance (pp. 165-172); Accredited Herds, by O. H. Ellason (pp. 176-181); Advantages of a State Accredited Herd, by J. R. Bent (pp. 181-191); Municipal Meat Inspection, by F. A. Ingram (pp. 191-196); How the State Live Stock Sanitary Officials Can Best Serve and Cooperate in Promoting the Interests of the Live Stock Producers, by E. Z. Russell (pp. 196-204); and Live Stock Sanitation, Past, Present, and Future, by J. G. Rutherford (pp. 204-217).

Included in the reports of committees, which follow, are a tabular summary of tick eradication progress, July 1, 1906, to December 11, 1916; a paper on Infectious Stomatitis of Horses, by E. C. Schroeder; a note on oldiomycosis in cattle; a paper on Some New Centers of Anthrax, by A. T. Kinsley; and a summary of the occurrence during the year of the more important infectious diseases of live stock throughout the United States, prepared by State veterinarians. The Proposed Uniform State Regulations Governing the Movement of Live Stock are also given.

Biennial report of the State Board of Stock Commissioners, 1915-16. (*Bien. Rpt. Bd. Stock Comrs., Nev., 1915-16, pp. 23*).—The occurrence of and work with the more important diseases of live stock in Nevada are reported upon by W. B. Mack.

Report of the New York State Veterinary College at Cornell University for the year 1915-16 (*Rpt. N. Y. State Vet. Col., 1915-16, pp. 314, pls. 23, figs. 12*).—In addition to the several reports on the work of the college during the year 1915-16, the following papers are presented: Hog Cholera Transmission Through Infected Pork (pp. 60-93) (E. S. R., 37, p. 691) and Hog Cholera and Its Prevention (pp. 84-116), by R. R. Birch; Researches upon Abortion of Cattle, by W. L. Williams (pp. 117-138); A Preliminary Study of the Pathology and Bacteriology of Ovaritis in Cattle, by C. P. Fitch (pp. 199-208); Further Report on the Diagnosis of Open Cases of Tuberculosis, by D. H. Udall and R. R. Birch (pp. 209-225) (E. S. R., 38, p. 881); Leukemia and Pseudo-leukemia in the Common Fowl (pp. 226-251) and Roup and Chicken-pox (pp. 252-263), by E. M. Pickens; A Study of Five Members (or So-called Species) of the Septicemia Hemorrhagica (*Pasteurella*) Group of Organisms, With Spe-

cial Reference to Their Action on the Various Carbohydrates, by A. M. BESCHER (pp. 260-282) (E. S. R., 37, p. 583); A Study of the Fermenting Properties of *Bacterium putlorum* and *B. sanguinarum*, by S. A. GOLDBERG (pp. 283-283) (E. S. R., 37, p. 483); and Amylolytic Activity in the Domestic Animals With Special Reference to the Saliva of the Horse, by C. E. HAYDEN (pp. 294-310).

Eleventh annual report of the State Live Stock Sanitary Board, North Dakota, 1917, W. L. RICHARDS ET AL. (*Ann. Rpt. Live Stock Sanit. Bd. N. Dak.*, 11 (1917), pp. 40).—This reports upon the occurrence of and work with the important infectious diseases of live stock, particularly tuberculosis.

[Report of the] veterinary division, O. H. ELIASON (*Wis. Dept. Agr. Bul.* 10 (1916), pp. 83-103, figs. 5).—This report on the occurrence of and work with the more important diseases during the year deals particularly with tuberculosis. A discussion of a plan for accredited tuberculin-tested herds is included.

Report of proceedings under the diseases of animals acts, with returns of the exports and imports of animals for the year 1916, D. S. PRENTICE (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Diseases Anim.*, 1916, pp. 34).—The usual annual report (E. S. R., 37, p. 577).

Report of the civil veterinary department, Assam, for the year 1916-17, W. HARRIS (*Rpt. Civ. Vet. Dept. Assam, 1916-17*, pp. 2-19).—The usual annual report (E. S. R., 36, p. 879).

Annual report on the civil veterinary department, United Provinces, for the year ending March 31, 1917, S. G. M. HICKEY (*Ann. Rpt. Civ. Vet. Dept. United Prov.*, 1917, pp. [28]).—This report includes data on veterinary instruction and on the occurrence and treatment of infectious diseases.

Report on the civil veterinary department (including the Insein Veterinary School), Burma, for the year ended March 31, 1917, G. H. EVANS (*Ann. Rpt. Civ. Vet. Dept. Burma, 1917*, pp. 8-13, pl. 1).—The usual annual report (E. S. R., 36, p. 879).

Annual report of the veterinary department for the year ended March 31, 1916, R. J. STORBY (*Dept. Agr. Brit. East Africa Ann. Rpt. 1915-16*, pp. 62-71).—The usual annual report on the occurrence of and work with contagious diseases of domestic animals in British East Africa.

Reports of the National Serum Institute, Holland, 1911-1915, J. POMLS (*Verslag Rijksseruminricht. [Holland]*, 1911, pp. 84; 1912-1915, pp. 150).—These are the reports of the institution for 1911, 1912, 1913, 1914, and 1915 containing the usual data as previously noted (E. S. R., 29, p. 377).

Pharmacological studies of the ipecac alkaloids and some synthetic derivatives of cephaelin.—III, Studies on protozoocidal and bactericidal action, A. L. WATERS, W. F. BAKER, and E. W. KOCH (*Jour. Pharmacol. and Expt. Ther.*, 10 (1917), No. 5, pp. 341-364).—Tests of the amebicidal action, entamebicidal effects, action on paramoeba, and bactericidal action of the above-mentioned drugs are reported.

"Emetin hydrochlorid in solution of 1:1,000 when acting on water amebas for one hour, or in solution of 1:5,000 acting for three hours, destroyed many of these organisms but was not uniformly amebicidal. . . . Emetin hydrochlorid in solutions as strong as 1:100 is not rapidly destructive to *Entamoeba buccalis*, in some cases not killing in one hour.

"The propyl and isoamyl ethers of cephaelin are stronger than emetin as amebicides, but their action on water amebas or *E. buccalis* can not be used satisfactorily as a comparative measure of this action. Methylating cephaelin to form emetin is known to increase the entamebicidal action as well as the protozoocidal action toward paramoeba, and the substitution of the methyl group by ethyl, propyl, butyl, isoamyl, or allyl further intensifies this action. The propyl, butyl, and isoamyl ethers of cephaelin possess much stronger proto-

soidal properties than the methyl ether (emetin). Cephaelin isoamyl ether phosphate was the most effective alkaloid of this group in killing paramacia, being 15 to 20 times as active as emetin phosphate.

"Tested on *Staphylococcus aureus* in the manner described, cephaelin propyl ether phosphate is germicidal in solutions of 1:222, and cephaelin isoamyl ether phosphate in solutions of 1:4,120. Both of these derivatives are much stronger than emetin in germicidal action."

The toxicity of salvarsan and neosalvarsan, LOUISE PEARCE and W. H. BROWN (*Jour. Pharmacol. and Expt. Ther.*, 9 (1917), No. 6, pp. 354, 355; *Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 6, pp. 835, 836).—In experimental tests of the toxicity of these drugs, carried on with laboratory animals, neosalvarsan has shown greater irregularities in toxicity than salvarsan and produced more marked pathological alterations and impairment of vitality in experimental animals. The Abderhalden test for pregnancy in animals, C. A. ZELL (*Jour. Amer. Vet. Med. Assoc.*, 52 (1917), No. 1, pp. 39-47).—This is a general review of the theory and technique of the test, together with summarized data of the author's personal experience with it.

It is concluded that the test in animals is very reliable if a very exact technique is employed. Special care should be taken in the preparation of substrates and in the selection and use of the dialyzers. The blood sample must be taken in an absolute stage of hunger and the serum must be sterile and free of hemoglobin and blood corpuscles. In cases where it is possible, the animal should be examined for the presence or absence of any form of leucocytosis.

The value of physical examination in conjunction with the biological test is noted. The biochemical activity of agglutinating bacteria, A. ZIRONI (*Atti R. Acad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 26 (1917), II, No. 1, pp. 9-23, fig. 1).—The author studied the acid and carbon dioxide production and the reduction of methylene blue by the agglutinating bacilli paratyphoid B and cholera vibrio. No great differences were observed in the activities between the agglutinating organisms and the controls.

It is concluded that the agglutinating property possessed by bacteria does not modify their general biochemical activity or power of reproduction.

A special apparatus for determining the carbon dioxide production of cultures was devised for the work and is described.

A simple method of obtaining blood serum, M. G. WOHL (*Jour. Lab. and Clin. Med.*, 3 (1917), No. 1, pp. 68, 69).—The author has found that a thin coat of paraffin on the walls of the test tubes causes blood which usually adheres to the walls of an ordinary container to yield a clear serum. The paraffin was not found to alter the serum in any way for use in either the Wassermann or Vidal reactions.

Preservation of antishock hemolytic amboceptor in glycerol, R. O. CLOCK and S. D. BEARD (*Jour. Infect. Diseases*, 21 (1917), No. 4, pp. 404-408).—"Fresh antishock hemolytic amboceptors that were heated to 55° C. for one-half hour and then mixed with an equal volume of glycerol did not deteriorate but retained their original titer for three years. During that period anticomplementary properties did not develop. The glycerol in the glycerolated antishock hemolytic amboceptor did not influence the complement-fixation reaction. Fresh antishock hemolytic amboceptors that were inactivated and then preserved in glycerol... were not only remarkably stable but were also protected from bacterial growth for a period of three years."

Toxicity of heterologous and homologous serums, C. E. ROSEN (*Jour. Lab. and Clin. Med.*, 2 (1917), No. 8, pp. 538-551).—This is a general discussion of the subject and of the two principal theories of anaphylaxis.

A bibliography of 51 references to the literature cited is appended.

Studies in anaphylaxis, XXI, XXII (*Jour. Immunol.*, 2 (1917), No. 6, pp. 525-558, 571, 572).—Continuing previous work (E. S. R., 88, p. 78), two studies are here reported.

XXI. *Anaphylaxis in dogs.—A study of the liver in shock and in peptone poisoning*, R. Well (pp. 525-558).—Results are presented which indicate a new function of the liver, namely, its participation in the immune reaction. "This participation does not appear to be indirect, as had previously been believed, namely, by virtue of the toxic degradation of the antigen. On the contrary, it is a direct and immediate reaction profoundly involving the functions and structure of the organ. The accompanying general symptoms appear to be merely accidental by-products of this reaction. . . .

"It is perhaps needless to add that the hepatic reaction does not occur during the course of the infectious diseases in the exaggerated form induced by the anaphylactic experiment; but that it plays a more subdued and continuous rôle can hardly be doubted, in view of the direct evidence afforded by the study of the blood in human serum sickness. Similar effects upon coagulability as determined in anaphylactic guinea pigs lead to the belief that the liver is probably a constant and important factor in the immune reaction throughout the mammalia."

XXII. *Anaphylactic reactions of the isolated dog's liver*, R. Well and C. Eggleston (pp. 571, 572).—This is a brief note of experiments which have been interrupted. The results obtained confirm and extend the conclusions of the preceding study.

Tissue transplantation and anaphylaxis, L. LOEB (*Jour. Immunol.*, 2 (1917), No. 6, pp. 557-569).—The results of the study reported show that the injection of horse serum into animals into which have been transplanted the uterus and thyroid from animals which were previously injected with horse serum does not have any distinct influence on the life and growth of the transplanted piece, nor does it noticeably alter the lymphocytic reaction on the part of the host tissue.

In cases in which a second injection is made the general health of the animal is affected and the transplanted piece may also suffer. "The lack of effect of the injections in the majority of the experiments does not of course exclude the possibility that with still further variations in dosage or time relations an influence of the sensitization to horse serum may be demonstrable. It might be especially desirable to repeat the experiment, choosing dosage and time of injection in such a way that the second injection has a definite effect on the general condition of the guinea pig. If it should again be found that in those animals in which the second injection produces general effects the state of preservation of the transplanted piece is interfered with, we would have to decide further whether in this case we are dealing with a specific effect of the injections on the transplanted piece or with a nonspecific effect, due to interference with the proper nourishment of the tissue as the result of circulatory and general metabolic changes in the host."

* Anthrax, C. H. HIGGINS (*Canada Dept. Agr. Health Anim. Branch Bul.* 23 (1916), pp. 8).—A popular summary of information.

Tuberculosis, with special reference to cattle and pigs, G. E. BUNNING ET AL. (*Brisbane, Queensland: Govt.*, 1917, pp. 13).—This is a report of a committee appointed by the Queensland Committee of the Advisory Council of Science and Industry. The questions reported upon are the preparation of a tabulated statement of the loss directly attributable to tuberculosis, its relationship to the profitable conduct of mixed farming, the practicability of building up an export trade in pork products, and the relationship of tuberculosis to the health of the community.

Details to be observed in making a tuberculin test, C. LUNCH (*Jour. Amer. Vet. Med. Assoc.*, 52 (1917), No. 1, pp. 56-63).—The author discusses briefly cer-

in precautions necessary for obtaining reliable results in the tuberculin test, especially in regard to avoiding conditions which tend to cause a rise in temperature. **Piroplasmosis and anaplasmosis in Turkey (1916).** W. STERKO (*Bul. Soc. eth. Esol.*, 10 (1917), No. 8, pp. 723, 724).—During the summer of 1916 the author observed piroplasmosis and anaplasmosis in many cattle from Russia, Trebizond, Platana, Rizeh, and elsewhere in Turkey. The percentage of fatal cases was very high, from 80 to 90 per cent. Smears from the spleen showed the presence of *Piroplasma bigeminum*, *P. annulatum*, and *Anaplasma centrale*, a double infection occurring very frequently. The cattle tick is the intermediate host concerned. *Ixodes corniger* and *Rhipicephalus simus* occur but are not so widely distributed.

A disease in cattle in the Philippine Islands similar to *Anaplasma marginale*, W. H. BORNTRON (*Philippine Agr. Rev.*, [English Ed.], 10 (1917), No. 2, p. 119-127, pls. 3, fig. 1; *Philippine Jour. Sci.*, Sect. B, 12 (1917), No. 6, pp. 31-391, pls. 3, fig. 1).—In an investigation made of a disease of three native cattle which arrived at Manila from Ratan Island, bodies were found in the red blood cells that were similar to *A. marginale*, as described by Theiler and Leber (E. S. R., 26, p. 882), and one of the cows presented the symptoms and lesions of anaplasmosis. The heart's blood of this animal was injected subcutaneously into a supposedly susceptible bull, but the blood had no effect upon his animal that could be determined, either physically or by blood examination, during a period of 226 days.

Contagious abortion of cattle, H. WELCH (*Montana Sta. Circ.* 61 (1917), p. 41-48, fig. 1).—A popular summary of information.

The avenue of invasion and the behavior of the infection of contagious abortion in the uterus, W. L. WILLIAMS (*Jour. Amer. Vet. Med. Assoc.*, 52 (1917), No. 1, pp. 13-33).—A paper presented at the annual meeting of the American Veterinary Medical Association at Kansas City, Mo., in August, 1917.

While the original portal of entry of the abortion infection into the system in most cases of natural infection requires further study, the evidence at present points to two great sources (1) the intrauterine infection of the fetus and (2) contaminated milk fed to the new-born calf.

Bovine onchocerciasis in Argentina, M. PIÉTRE (*Bol. Min. Agr. [Argentina]*, 11 (1917), No. 1, pp. 35-41, figs. 16).—*Onchocerca bovis* is thought to be the species which causes this affection of cattle in Argentina. See also a previous note (E. S. R., 37, p. 80).

Tuberculous mastitis in the cow: Its pathogenesis and morbid anatomy and histology, J. M'FADYEN (*Jour. Compar. Path. and Ther.*, 50 (1917), Nos. 1, pp. 57-77; 2, pp. 139-172, pl. 1, figs. 39).—This is a general discussion of the subject with a review of the literature.

Coccidiosis of calf, L. B. BATES (*Proc. Med. Assoc. Isthmian Canal Zone*, 8 (1915), pt. 1-2, pp. 92-94).—The author reports upon the occurrence of coccidiosis in a calf which came in contact with rabbits affected with the same disease and thought to have been caused by *Eimeria stiedae*.

Parasites affecting sheep, C. P. FIRCH (*Cornell Vet.*, 7 (1917), No. 4, pp. 233-254, figs. 4).—A summarized account.

The control of hog cholera, with a discussion of the results of field experiments, A. D. MELVIN and M. DORSET (*U. S. Dept. Agr. Bul.* 584 (1917), pp. 13, figs. 2).—This is a review of control work with hog cholera which has been carried on by the department in cooperation with State officials. While no feasible plan has yet been devised for the complete eradication of hog cholera, it is deemed entirely possible to control the losses from the disease, thus placing hog raising upon a relatively stable basis, freed for the most part from the hog-cholera menace.

"The plan of slaughter of infected herds with strict quarantine and disinfection of premises, such as has been pursued successfully in combating foot-and-mouth disease, is entirely unsuitable for the control or eradication of hog cholera in the United States. . . . Potent antihog-cholera serum, if used promptly and intelligently on infected herds, will save a large portion of hogs which would otherwise succumb."

An inquiry into the horse disease known as septic or contagious pneumonia, H. WATKINS-PITCHFORD (*Vet. Jour.*, 73 (1917), No. 508, pp. 345-362, figs. 6).—The author's studies here reported indicate that septic pneumonia and its generally associated primary catarrhal condition are not infectious, nor are they directly transferable from one horse to another except under certain conditions of experimental infection. "The chief and probably the sole factor determining the establishment of the disease would appear to be a condition of lowered vitality of the mucous membrane of the respiratory tract, however brought about, thereby rendering possible the invasion of a prevalent micro-organism. In this way collective outbreaks of a seemingly infectious nature become explicable on the grounds of a common exciting cause."

Equine trypanosomiasis in Morocco, H. VELU (*Bul. Soc. Path. Exot.*, 10 (1917), No. 3, pp. 253-260; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 6, pp. 888, 889).—This is a report on inoculation experiments with mules, dogs, rabbits, rats, sheep, and goats with trypanosomes obtained from six different horses.

Hemorrhagic septicemia in mules, J. B. HARDENBERGH and F. BOERNER, JR. (*Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 6, pp. 817-822).—This is a report of an outbreak of hemorrhagic septicemia among young mules in Pennsylvania. The diagnosis was based upon the fact that the two cases autopsied showed characteristic lesions of the disease, as seen in the acute form in cattle, without the presence of pneumonia or any other condition to indicate that the lesions were of a secondary nature. In both cases the heart blood and tissue fluids were found teeming with typical bipolar organisms, cultures of which were readily isolated, and showed the growth characteristic of this group.

Notes in regard to horse lice, *Trichodectes* and *Hæmatopinus*, M. C. HALL (*Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 4, pp. 494-504, figs. 3).—These notes relate largely to the biology of the sucking louse (*Hæmatopinus asini*) and the biting louse (*Trichodectes parumpilosus* and *T. pilosus*) of the horse.

In longevity tests the sucking lice lived only one or two days off their host, whereas the biting lice lived from 5 to 8 days. Newly hatched lice of both the biting and sucking kinds died inside of 2 days when kept at a temperature of from 70 to 88° F. off the host animal. In Petri dishes under atmospheric conditions of humidity and at a temperature of 70 to 88°, the eggs of *T. pilosus* hatched in 5 or 6 days and those of *H. asini* in 10 to 19 days.

Incomplete tests indicate that *Trichodectes* is more resistant to insecticidal treatment than is *Hæmatopinus*. The sodium fluorid treatment, which has the advantage of being applicable in winter and apparently does not injure the hair or skin, was found to be effective against the biting lice but not successful in destroying the sucking lice.

Control of poultry lice and mites, W. F. SCHOPPE (*Montana Sta. Circ.* 44 (1917), pp. 65-71, figs. 6).—A popular summary of information.

RURAL ENGINEERING.

Irrigation of alfalfa in Imperial Valley, W. E. PACKARD (*California Sta. Bul.* 284 (1917), pp. 67-84, figs. 8).—This report is based in part on work done in cooperation with the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture and the State Department of Engineering of California.

The general conclusion is drawn that in the Imperial Valley "in order to get satisfactory yields of alfalfa a large amount of water must be supplied during the season, [and] it must be supplied frequently enough to prevent a drying of the surface soil on the one hand and water-logging of the soil on the other. This desirable condition can only be accomplished by conforming the grade of the land, the frequency of irrigation, the size of the field, and the head of water used to the types of soil to be handled. . . .

"The great danger in all sandy or porous soils is that too much water will be applied and a high water table thus formed. This condition is already prevalent in some sections where sand overlays clay. . . . The lands or borders for irrigation on this type of soil should usually not exceed one-eighth of a mile in length and, if necessary, not more than 25 to 30 ft. in width in order that the water applied may reach the lower end without oversaturating the upper end. . . . The exact length and width of the lands must depend on the condition of the surface and the degree of porosity of the soil.

"If the soil is very sandy, the lands should be both narrow and short in order to allow a quick irrigation. In addition to using smaller lands than are now being used, it would be an advantage in nearly all cases to use much larger heads of water than are at present used on this type of soil. In other parts of California a head of from 8 to 12 ft. is often run on to one land in order to get quick irrigation. . . . A head of from 3 to 8 cu. ft. per second for the very sandy soil and from 2 to 4 cu. ft. per second for the more compact sandy loams would not be too great.

"A soil auger can be very effectively used in determining the soil moisture condition where one is uncertain regarding the moisture penetration. In cases where the grade is less than 5 ft. to the mile in the directions in which the lands are built, and it can be increased to from 8 to 10 ft. to the mile by changing the direction of the lands, it should be done. . . .

"The sandy loam soils are easily irrigated, although too much or too little water is sometimes applied with the usual results. There is no good excuse, however, for not having a good moisture condition in these medium soft soils. If the alfalfa does not grow so rapidly as desired an investigation should be made of the moisture condition in the soil by the use of a soil auger or a spade. If the top soil appears too dry before irrigation it would perhaps be wise to give the field an additional light irrigation between cuttings. If the lower strata are saturated the recommendations given for hard or clay soils should be followed.

"The problem on the hard type of soils is to get the water deep into the soil in sufficient quantities to maintain rapid growth. . . . Land should be from an eighth to a quarter mile long, very seldom running one-half mile as is now a common practice. It is difficult to handle water properly on long lands, as a flooding of the lower end can seldom be avoided. On land that is comparatively flat borders 50 to 100 ft. apart are satisfactory, but when the land is at all steep lands should be narrowed down to 25 to 30 ft. wide so that a small head will cover the surface evenly. In order to get proper penetration it is necessary to run a comparatively small head for a long time. Fields which yielded from 2.5 to 3 tons per acre per year have been made to double the yield through this system of irrigation. A small head of water requires a much longer time to travel over the field than a larger head and allows of a better penetration. Land which could be wetted only to a depth of 3 ft. when large heads were used was successfully wetted to a depth of 5 and 6 ft. by the use of smaller heads. The effect of smaller heads running for a longer time is more noticeable with furrow irrigation than with flooding, but the effect is marked in both cases. The grade of hard land should not be over 5 or 6 ft. to the mile. A

grade of $\frac{1}{4}$ ft. is satisfactory if the land is properly leveled. Drains should be made at the lower ends whenever practicable, as scalding is very common on this type of soil. The drains should be large enough to prevent the accumulation of water at the lower ends."

Irrigation of grain, W. W. McLAUGHLIN (*U. S. Dept. Agr., Farmers' Bul.* 863 (1917), pp. 22, figs. 7).—This states that flooding from field ditches is the usual method of handling water in irrigating grain, but that the border and basin methods are also adapted to such crops. These methods are described in detail and the proper time to irrigate, quantity of water required, and cost of growing grain under irrigation are discussed.

The irrigation of alluvial soils, A. and GABRIELLE L. C. HOWARD (*Agr. Jour. India*, 12 (1917), No. 2, pp. 185-193, figs. 4).—Improvements in methods of irrigating crops on alluvial soils in India with a view to increasing the duty of water are described.

Pumping for irrigation, H. E. MURDOCK (*Montana Sta. Circ.* 60 (1917), pp. 9-37, figs. 17).—This circular deals with the design, construction, operation, and cost of pumping plants for irrigation under Montana conditions.

It is stated that with care from 0.5 to 1.5 acre-feet of water per acre may be sufficient to mature crops in Montana. Some of the subjects taken up more in detail are centrifugal, turbine, and plunger pumps, windmills, gasoline and oil engines, and electric motors for irrigation pumping. Engine, pump, and belt and pulley troubles are also discussed and remedies suggested.

"From a consideration of all the expenses connected with pumping for irrigation, all factors should be included in an estimate for the design of a plant. Economy in the cost of applying the water calls for a large plant or a storage reservoir. Saving in the engineer's salary calls for a plant where the engineer can do the irrigating. Interest and depreciation cost calls for a small plant and a long irrigating season. Before installing an irrigation pumping plant, competent engineering advice regarding its design should be secured."

The use of windmills in irrigation in the semiarid West, P. E. FULLER (*U. S. Dept. Agr., Farmers' Bul.* 866 (1917), pp. 38, figs. 12).—This is a revision of Farmers' Bulletin 394 (*E. S. R.*, 23, p. 395). It deals with sources of water supply, quantity of water available, sinking wells, well casing, capacity of mills, choice of tower, erection and maintenance of mills, pumps, and reservoirs. A final section describes windmill-pumping installations in present use. Considerable practical data in tabular form are included.

Practical information for beginners in irrigation, S. FORTNER (*U. S. Dept. Agr., Farmers' Bul.* 864 (1917), pp. 38, figs. 23).—This is a revision of and is designed to supersede Farmers' Bulletin 263 (*E. S. R.*, 18, p. 482). "The first few pages contain some suggestions to those who are confronted with the task of selecting a farm under an irrigation system. Arid soils and water supplies are considered in a general way from the standpoint of the irrigator. The greater part of the paper is taken up with a somewhat fuller description of how to locate and build farm ditches, how to prepare land to receive water, how to irrigate a few of the staple crops, and how much water to apply."

Practical methods of measuring flowing water, C. O. WISLIZ (*Mich. Engin.* 34 (1916), pp. 102-115; *abs. in Chem. Abs.*, 11 (1917), No. 5, p. 507).—In addition to gravimetric, volumetric, and weir methods, chemical gauging is described.

In this method some cheap chemical, usually salt, is added to the water at a constant rate. "At a point downstream where a thorough, uniform mixture has occurred samples are taken and the degree of dilution determined. If W pounds of NaCl be added to a stream whose discharge is Q cu. ft. per second, and it is found that N pounds of water contain 1 lb. of NaCl , the total discharge Q is

cubic feet per second will be $WN/62.5$. If V represents the mean velocity of the stream and b the breadth, then, when the average depth lies between $b/10$ and $3b/10$, complete mixture occurs at a distance downstream $=6b$ and at a time when the addition of the chemical has continued at least $24b/V$ seconds. Samples must not be taken more than $6b/V$ seconds after the addition of the chemical has ceased. These rules do not apply to streams whose average depth is less than $b/10$; then the point and time of sampling must be made by trial."

A bibliography is included.

Hydraulic conversion tables and convenient equivalents (*U. S. Geol. Survey, Water-Supply Paper 425-C (1917), pp. 71-94*).—Specially prepared tables are given which afford a ready means of conversion between the terms in common use in hydraulic computations. These should be of material assistance to irrigation engineers.

Ground water for irrigation in Lodgepole Valley, Wyoming and Nebraska, O. E. MENZIES (*U. S. Geol. Survey, Water-Supply Paper 425-B (1917), pp. 37-69, pls. 3, 4*).—This report deals with the underground waters of an area of about 2,200 square miles in southwestern Nebraska and southeastern Wyoming. Analyses of the waters are given which show them to be satisfactory for irrigation and domestic use. Data concerning wells in Laramie County, Wyo., and Kimball, Cheyenne, and Deuel Counties, Nebr., are also given.

"Yields yielding enough water for practical irrigation can be obtained in most parts of Lodgepole Valley and the total irrigated area could be considerably increased by pumping. However, the area now irrigated is very large in comparison to the size of the stream, because ground water is supplied to the stream during the irrigation season. Extensive pumping of ground water would reduce the available supply of stream water, although the decrease in stream water would be less than the increase in pumped well water. Pumping on a moderate scale will probably not appreciably reduce the supply of stream water and is doubtless practicable in Lodgepole Valley. Flowing wells could probably be obtained by deep drilling in some parts of the valley, but the prospects are not encouraging for obtaining supplies from deep wells in quantities or at costs practicable for irrigation."

In an appended article entitled Cost of Pumping for Irrigation in Western Nebraska, data are reported by H. C. Diesem as summarized in the following tables:

Results of operating certain pumping plants in Nebraska in 1914.

Plant				Pumping.		Cost.			Area to which water was applied once.
No.	Engine horse-power.	Pump. ¹	Lift.	Time.	Quantity.	Total for season.	Per acre-foot.	Per acre-foot per foot lift.	
			Feet.	H. m.	Acres-ft.			Cents.	Acres.
1.....	25	5 T	45	436 35	40.11	\$78.52	\$1.958	4.35	100.0
2.....	15	6 H	34	487 00	47.07	70.69	1.502	4.42	104.6
3.....	25	6 V	40	116 55	19.68	37.27	1.894	4.74	68.0
4.....	15	5 V	28	190 00	27.23	43.65	1.603	5.73	63.0
5.....	20	6 V	31	128 00	18.88	36.19	1.917	6.18	41.5
6.....	22	6 H	43	96 00	13.12	38.40	2.774	6.46	35.0
7.....	15	5 H	32	600 25	15.79	54.11	3.428	7.79	60.6
8.....	30	6 V	44	81 00	80.06	185.76	2.320	7.25	220.0
9.....	15	6 V	35	355 30	26.96	54.11	3.056	8.98	60.6
10.....	20	5 H	33	176 00	14.67	43.48	2.922	8.75	120.0
11.....	18	5 H	28	151 00	14.28	38.40	2.699	9.63	28.0
12.....	15	6 H	28	90 00	11.70	42.54	3.636	13.00	20.9

¹ Centrifugal pumps. Figure indicates number or size. H=horizontal, V=vertical, T=turbine.
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Number and cost of irrigations at certain pumping plants in Nebraska in 1914.

Plant No.	Crop irrigated.	Area irrigated, in acres.	Number of irrigations.	Water applied.		Cost.	
				Total, in acre-feet.	Acres irrigated per acre.	Per acre.	Per acre-inch.
1.....	Corn.....	40.0	2	80.20	4.00	\$1.482	\$0.148
2.....	Beets.....	37.3	2	74.60	3.73	1.922	.128
3.....	Corn.....	26.0	2	52.00	2.60	1.104	.153
4.....	do.....	22.0	2	44.00	2.20	1.206	.133
5.....	do.....	10.0	2	20.00	1.00	1.764	.189
6.....	do.....	35.0	1	35.00	35.00	1.600	.200
7.....	do.....	110.0	2	220.00	110.00	2.008	.200
8.....	do.....	3.0	3	9.00	3.00	1.372	.255
9.....	do.....	60.0	2	120.00	60.00	2.267	.267
10.....	do.....	18.0	1	18.00	18.00	2.307	.255
11.....	do.....	12.0	2	24.00	12.00	2.177	.255
12.....	do.....	20.0	1	20.00	20.00		.255

Surface water supply of western Gulf of Mexico basins, 1916 (*U. S. Geol. Survey, Water-Supply Paper 438 (1917), pp. 106+XXVI, pls. 2*).—This report presents the results of measurements of flow made on the Colorado, Rio Grande, and other river basins in the western Gulf of Mexico drainage area, together with the usual list of gauging stations and publications.

Recent advances in the improvement of water supplies, C. E. A. Winslow and ANNA M. R. LAUDER (*Conn. Soc. Civ. Engin., Trans. and Proc., 1915-16, pp. 17-27; abn. in Chem. Abs., 11 (1917), No. 5, p. 507*).—The efficiency of each of the four principal methods by which surface water may be made safe for drinking, namely, storage, slow sand filtration, mechanical filtration, and disinfection, are discussed, and typical examples noted with data on cost of operation.

The domestic water supply on the farm, H. E. MURDOCK (*Montana Sta. Circ. 66 (1917), pp. 83-103, pls. 12*).—This circular deals with the sanitary aspects of farm water supplies including wells, springs, and cisterns, and describes simple farm water supply systems which are adapted to Montana conditions. A brief section on farm sewage disposal is included.

Detection of typhoid and paratyphoid bacilli in feces and water, F. DIENERT and G. MATHIEU (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 2, pp. 124-126; abn. in Jour. Soc. Chem. Indus., 36 (1917), No. 4, p. 232*).—Experiments are reported in which it was found that coli bacilli developed very slowly during a period of 24 hours in a peptone solution containing variable quantities of malachite green and generally did not grow at all with concentrations of 1:8,000. The typhoid bacilli grew more rapidly in solutions containing from 1:5,000 to 1:2,000 concentrations of malachite green. Paratyphosus B grew more rapidly than paratyphosus A, and a solution containing a 1:2,600 concentration of malachite green was totally discolored by the growth of paratyphosus B in 24 hours. The use of malachite green in detecting and distinguishing pathogenic intestinal organisms in water and sewage is considered feasible, although all commercial malachite green is not suitable for this purpose.

The presence of paratyphoid organisms was easily demonstrated in Selw River water by this method.

The use of aromatic chloramin compounds for the sterilization of water for drinking purposes, R. L. M. WALLIS (*Indian Jour. Med. Research, 4 (1917), No. 4, pp. 800-817*).—Experiments on the use of chloramin T (para-toluene-

sodium-sulphochloramid) as a disinfectant for treating drinking water are reported.

It was found that 0.04 gm. of chloramin T will completely sterilize 1 liter of any water in 10 hours even when 10,000 organisms per cubic centimeter are present. "The water so treated is entirely devoid of any unpleasant taste, and will remain sterile for at least four days. There is evidence to show that its activity is markedly increased by the presence of organic matter in solution in the water, in fact organic matter is essential for the compound to exert its action as a disinfectant. Chloramin T possesses many advantages over bleaching powder as a chemical reagent for sterilizing water, more particularly its definite and unalterable composition, its stability in solution, nontoxicity, absence of corrosive action, and nonproduction of an unpleasant taste in the treated water. All the results tend to demonstrate that we have in certain of the chloramins the ideal reagent for sterilizing water on a large scale."

Standard road sections (*Helena, Mont.: Mont. State Highway Com. [1917], pp. 12, figs. 10*).—Diagrammatic illustrations of standard road sections used by the Montana State Highway Commission are given.

Standard plans, box culverts, slab and girder bridges, 1916 (*Des Moines, Iowa: Iowa State Highway Com., 1916, pp. 27, figs. 26*).—This book contains a complete set of standard plans for concrete highway culverts and slab and deck girder bridges issued for 1916 by the Iowa State Highway Commission.

"The box culvert designs . . . are prepared for both straight and flaring wing walls for span lengths ranging from 2 to 12 ft. The standard slab designs . . . are prepared for lengths of span from 14 to 24 ft. The deck girder designs . . . range in span lengths from 24 to 40 ft."

Highway bridges, 1917, G. HOGARTH (*Ann. Rpt. Dept. Pub. Highways Ontario, 1916, App., pp. 26, figs. 25*).—This is an appendix to the annual report of the Department of Public Highways of Ontario and deals with the construction of highway bridges in the Province. It is in part explanatory of the specifications for steel and concrete bridges issued by the department and also complementary to the series of general plans issued for steel and concrete bridges.

Tests of concrete slabs to determine the effect of removing excess water used in mixing, A. N. JOHNSON (*Good Roads, n. ser., 14 (1917), No. 3, pp. 31, fig. 1*).—Experiments with 12 concrete slabs 2.5 ft. wide, 5.5 ft. long, and 6 in. thick to determine the influence on strength of removing the excess water by rolling, as is being done in concrete road work, are reported. A 1:2:3 mixture was used, and the consistencies used were a dry and a wet consistency finished with a wood float and a wet consistency finished with a roller.

It was found that "those slabs finished with the roller developed a very considerable increase in strength over the slabs merely hand-finished. The four slabs of wet consistency that were finished by hand have an average modulus of rupture of 308 lbs. per square inch, while the four slabs finished with the roller have an average modulus rupture of 369 lbs. per square inch, or an increase of almost 20 per cent. . . . The slabs that were made of a stiffer mixture, indicated in the table as medium consistency, giving an average modulus of 340 lbs. per square inch, are stronger than those of the wet consistency, finished in the same manner; but the wet-consistency slabs finished with the roller are stronger than those of the medium consistency, showing an increase of nearly 10 per cent.

"The results seem to indicate clearly the value to be gained by the use of the roller to finish a concrete road; that it is possible by proper manipulation of concrete to secure increased strength and density of a character most desirable for a concrete road surface; and that such surplus water as may be required

to facilitate placing concrete in road work can be effectively removed by this simple expedient."

Calcium carbide and acetylene, G. G. POND (*Bul. Dept. Chem., Penna. State Col., 1917, 3. ed., pp. 139*).—This extension report on acetylene gas heating and lighting is the second revision and enlargement of material previously noted (E. S. R., 12, p. 697) and should be of value in a study of rural lighting systems.

Haymaking machinery, J. R. BOWN (*Jour. Bd. Agr. [London], 24 (1917), No. 2, pp. 129-142, figs. 4*).—Machines and devices used in England in the making processes and carrying operations of haymaking are described and illustrated.

Homemade silos, H. RABILD and K. E. PARKS (*U. S. Dept. Agr., Farmers' Bul. 855 (1917), pp. 55, figs. 47*).—This is a revision of Farmers' Bulletin 589 (E. S. R., 31, p. 591.)

The construction of the wood-hoop silo, J. B. DAVIDSON and J. E. STUZZ (*California Sta. Circ. 173 (1917), pp. 15, figs. 12*).—This circular briefly explains the details of wood-hoop silo construction with special reference to conditions, requirements, and available materials and facilities of California.

Poultry houses and appliances (*London and New York: Cassell & Co., Ltd., 1917, pp. 156, figs. 226*).—This is a popular handbook of information on the subject, containing the following chapters: The building of poultry houses; troughs and fountains; nesting boxes and trap nests; coops; some special pens; scratching sheds, etc.; hurdles, fences, etc.; various poultry houses described in detail; ornamental poultry houses; intensive-system poultry houses described in detail; heated chicken-rearers; cold chicken-rearers; and grain distributor for poultry.

Chicken houses, R. M. SHERWOOD (*Kansas Sta. Circ. 61 (1917), pp. 15, figs. 16*).—This circular points out the general requirements of chicken-house construction for Kansas conditions, and includes illustrations of a number of chicken houses and floor plans for the same, showing various plans of building, arrangements of fixtures, and systems of ventilating.

Ice houses, H. E. MURDOCK (*Montana Sta. Circ. 59 (1916), pp. 8, figs. 4*).—This circular deals with the design and construction of farm ice houses, with special reference to Montana conditions.

RURAL ECONOMICS.

Agricultural cooperation and organization, G. RADFORD (*London and New York: Hodder & Stoughton, 1917, 2. ed., pp. 154*).—The author has defined the ultimate object of the cooperative movement as it affects the land in the production of more, better, and more uniform qualities in, stocks and crops, and the distribution of these when produced, both more efficiently and at a lower cost. He has applied these principles to the production of such articles as milk and milk products, meat, bacon, and poultry, and to finance, insurance, and transportation.

Cooperative buying by farmers' clubs in Minnesota, E. D. DURAND and H. B. PRICE (*Minnesota Sta. Bul. 167 (1917), pp. 3-44, figs. 2*).—The authors have described a number of typical buying organizations of farmers as found in Minnesota, and have summarized their investigations as follows:

"In Minnesota, cooperative buying by farmers' clubs and other similar associations and groups is comparatively unimportant from the standpoint of magnitude of business. Cooperative buying is more common in the less densely settled sections of the eastern, central, and northern parts of the State than elsewhere. The commodities chiefly bought are those which are bulky and are well standardized, the most important being feed, flour, and twine.

"In cooperative buying the direct money cost to the consumer usually represents some saving as compared with the prices that would otherwise have to

be paid. In some cases this saving is considerable, but in other cases insignificant. Judgment as to the actual advantage or disadvantage of cooperative buying can not be based exclusively on the amount of direct saving thus computed. . . .

"For certain classes of goods, such as groceries and hardware, manufacturers and wholesale dealers often refuse to give wholesale prices on cooperative purchases on account of the resulting injury to retail dealers who are their customers. Retail dealers, as might be expected, are usually opposed to cooperative buying from outside concerns, and maintain that in the long run the practice will injure not only them but also their customers."

Cooperation in Finland, H. GEBHARD, edited by L. SMITH-GORDON (London: Williams & Norgate, 1916, pp. XIII+190, pl. 1).—This is a translation of the revised edition of Gebhard's work. The author reviews the cooperative movement in the various countries of Europe and traces the origin and development in Finland. He also describes in some detail the Finnish local cooperative societies, their functions, and also their federation into the national organization.

First annual report of the State market director of California for the year ended December 1, 1916, H. WEINSTOCK (*Ann. Rpt. State Market Dir. Cal.*, 1 (1916), pp. 110).—This report gives in detail an account of the different marketing organizations which have been actively identified with the work of the State market director's office during the year ended December 1, 1916.

Federal Farm Loan Bureau, H. QUICK (*Chicago: Blackstone Inst.*, 1917, pp. 34).—This pamphlet consists of one of a series of lectures, and explains the circumstances leading up to the organization of the Federal Farm Loan Bureau, the plans and purposes of its organization, and the law under which it operates.

Scientific method of appraising farm lands ([*San Francisco, Cal.*: E. M. Ginty, 1917, pp. 16, figs. 6).—This publication is an outline of different factors that go to make up farm values and of methods that may be used in making appraisements.

Harvest help and wages [in Saskatchewan], T. M. MOLLOY (*Saskatchewan Dept. Agr., Ann. Rpt. Bur. Labor*, 6 (1917), pp. 24-27).—These pages call attention to the labor situation, methods of obtaining labor, and the sources used.

Child labor in the sugar-beet fields of Colorado, E. N. CLOPPER and L. W. HINE (*Child Labor Bul.*, 4 (1916), No. 4, pt. 1, pp. 176-206, figs. 17).—The authors have described the participation of children in the growing of sugar beets, and its influence upon their education and physical development.

Race suicide in the United States, W. S. THOMPSON (*Sci. Mo.*, 5 (1917), No. 1, pp. 22-25).—In this article the proportion of children born to women of child-bearing age is compared for rural and urban populations. The apparent influence of geography, difference in increase of native and foreign stock in the cities, and reasons for the more rapid increase of rural over urban population are reviewed.

Missouri country life conferences, 1917 (*Missouri Bd. Agr. Mo. Bul.*, 15 (1917), No. 2, pp. 99).—The greater part of the discussions in this conference relates to the methods of organizing farms, developing leadership, and the different rural education problems.

Rural life in Litchfield County, C. S. PHELPS (*Norfolk, Conn.: Litchfield Co. Univ. Club*, 1917, pp. 137).—This report describes the topography, soil, early settlement, historical development, and present conditions of agriculture in the county.

A brief social and economic survey of Floyd County, ESTELLE HUGHES (*Bul. State Normal School [Athens, Ga.]*, 4 (1917), No. 4, pp. 15).—This report is based on the study of the census and other documents to show the agricul-

tural population and educational and transportation situation in Floyd County, Ga.

A brief social and economic survey of Muscogee County, ELLA JONES (*Bul. State Normal School [Athens, Ga.], 4 (1917), No. 3, pp. 12*).—This report gives data corresponding to the above for Muscogee County, Ga.

New Hampshire farms (*Concord, N. H.: N. H. Dept. Agr., 1916, pp. 22, pl. 1, figs. 16*).—This publication contains a list of farms available for farming or summer homes and indicates their size, types of buildings, and distances from railroads and educational and religious institutions.

English farming, past and present, R. E. PROTHERO (*London: Longmans, Green & Co., 1917, 2. ed., pp. XI+504*).—This book is a reprint of a volume previously noted (*E. S. R., 28, p. 689*). The tables on wheat prices and agricultural statistics have been brought up to date.

The national food policy (*Roy. Soc. [London], Food (War) Committee, Nat. Food Policy [Papers], 1917, Danger of Restricting Consumption of Meat, pp. 3; Primary Importance of Bread, pp. 6; Maximum Prices, p. 1; Price Fixing, pp. 3; Memorandum upon a Limited Measure of Food Distribution, pp. 3*).—These papers relate to methods of meeting the food situation in Great Britain, both at the present time and in the future.

It is pointed out that it should be the policy to maintain a full supply of cereals at all cost; that maize, barley, rice, and other grains should be preserved for human consumption; and that each individual should be urged to reduce his food to the minimum required for efficiency. Measures should be adopted to reduce the number of cattle, sheep, and swine, and the tonnage if possible should be decreased by decreasing the importation of meat. The committee also believe that no restrictions should be placed on the consumption of meat, and that home-grown meat should be used for the army, navy, and civil population. They point out that a high price is not only a strong incentive to production but also an insistent reminder of the necessity of avoiding waste. The free play of prices provides the motive power for the distribution of produce.

The economic resources of the German colonies (*Bul. Imp. Inst. [So. Kensington], 13 (1915), Nos. 1, pp. 110-134; 2, pp. 233-260, fig. 1; 3, pp. 392-422; 4, pp. 553-581*).—These articles describe the development of native and European agricultural products and livestock in German East and Southwest Africa, and the German West African colonies and Pacific possessions.

Annual report on the agricultural department for the year 1915, R. ARMSSTRONG (*Ann. Rpt. Agr. Dept. Zanzibar, 1915, pp. 44-68*).—This report gives for Zanzibar the production and trade in agricultural products, and the report of the meteorological conditions during the year.

AGRICULTURAL EDUCATION.

Work of school children during out-of-school hours, C. D. JARVIS (*U. S. Bur. Ed. Bul., 20 (1917), pp. 28*).—This investigation is concerned with the education of school children who work during out-of-school hours; the amount money value, and nature of the work performed; how school children spend their leisure hours; why they leave school at an early age; and to what extent gardening can replace less desirable forms of employment. It covers the activities of a total of 14,391 boys and girls of the fifth, sixth, and seventh grades, of urban communities in 11 States, namely, Alabama, Arkansas, Connecticut, Delaware, Iowa, Michigan, Missouri, Ohio, Pennsylvania, Utah, and Washington.

Of these children 5,181 were employed during summer vacation. Their total earnings amounted to \$68,342, or an average of \$13.19, but 7 per cent averaged

50001. Twenty-seven per cent of the children worked during out-of-school hours throughout the year, with average weekly earnings of \$1.51; of these 7 per cent averaged \$2.67 per week. Of the total number of workers, nearly 33 per cent of the boys and 26 per cent of the girls performed farm work for pay, including the picking of fruit, weeding, hoeing and cultivating crops, and caring for poultry, horses, and other live-stock.

From the standpoint of educational opportunities farm work is considered to rank high. Children gain skill from working with the hands, and such varied experiences as are offered on the farm furnish abundant opportunity for an all-round development of the senses. They also have an opportunity to observe some of the workings of nature, which should make them broader and more contented. From the vocational standpoint, also, children engaged in farm work are able to learn many things that prove of use to them in later life. Ability to grow plants is valuable from both vocational and avocational standpoints.

It was found that 8.5 per cent of the children desired to leave school. Of these 34 per cent frankly stated they do not like school, and 60 per cent would rather go to work. As a remedy for this school-leaving problem the author recommends (1) remunerative employment for children while attending school, such as home gardening projects, the educational value of which is greatly enhanced by conducting them on a real money-earning basis; (2) a change in educational methods aiming to vitalize school work and thus make school more interesting and retardation less common; and (3) the establishment of continuation courses for children who must leave school.

Statistical data show that 27 per cent of the children conducted independent garden exercises. These gardens averaged 1,101 sq. ft., and gave an average return of \$3.59. There were 361 children who raised produce valued at \$10 or over, 81 valued at \$25 or over, 30 valued at \$40 or over, and 22 valued at \$50 or over. There was available for all pupils an average of 961 sq. ft. of land for gardening, which with intelligent handling should produce, at 10 cents per square foot, returns of \$96.10 to each operator. To provide for gardening and other practical arts instruction would necessitate the reorganization of school work, including the rearrangement of the school year so that the summer vacation may come in the middle of the year instead of at the end.

Farm work and schools in Kentucky, E. N. CLOPPER (*Child Labor Bul.*, 5 (1917), No. 4, pp. 178-206, figs. 22).—This report is concerned with the interference of farm work with the attendance of children at rural schools in Kentucky and is based on a study made in seven selected counties. The author calls attention to the fact that the 1910 Federal census of occupations credits Kentucky with 64,692 child workers from 10 to 15 years of age, of whom 82 per cent are reported as agricultural laborers, most of them on the home farm, as compared with slightly less than 72 per cent for the entire country.

The study indicates that farm work, including all processes of tobacco culture except firing; plowing, cultivating, and cutting corn; filling silos; thrashing grain; picking berries; making hay; and drying apples interferes more than any other factor with the education of rural children in Kentucky.

The economic situation of the small farmer in Kentucky is discussed somewhat in detail, inasmuch as the demands of his work and his inability to hire labor may be responsible for his being unable to keep his children in school throughout the term. It is stated that "the child labor laws of the States do not apply specifically to agriculture, although an act of Nebraska forbids children under 16 years of age to work in beet fields at night or more than 8 hours a day, and one of New York provides that boys over 12 years of age must not work more than 6 hours a day in gathering produce, whatever that

may mean. The only restrictions in the statutes of Kentucky that apply to child workers on farms concern their attendance at school."

The education of city boys on the land: A preliminary inquiry, J. J. FINLAY (*Jour. Bd. Agr. [London], 24 (1917), No. 1, pp. 21-32*).—The author discusses the results of an inquiry to discover what efforts are being made to educate city boys over 12 years of age to fit them for rural occupations, i. e., not merely to give them lessons in a country school, but to provide them with first-hand experience of country occupations. He found only two institutions in Great Britain that definitely aimed to teach agriculture to city boys, viz, the Scouts' Farm established by Sir Robert Baden Powell at Wadhurst in Kent and the endowed school at Staunton-on-Wye, Hereford.

Institutions for waifs and strays and the reformatory and industrial schools bring a certain portion of their inmates back to the land in two ways: (1) By sending boys who are educated wholly in the cities to farmers under license, very often to South Wales or to Ireland, thus keeping them at farm work until they are at least 18 years of age; and (2) by training boys on farms which are maintained side by side with other industries at some of these institutions. In this connection mention is made of the Lancashire Branch of the National Children's Home and Orphanage at Edgeworth, which is practically a model country village in which boys and girls engage in all of the domestic, industrial, and agricultural crafts which their common life demands; also of the Desford Farm School, conducted for some four years at Evershot in Dorsetshire, which is a certified industrial school, specializing in farming and gardening, as well as in the staple trades of Leicester.

Most of the boys turned into farmers at Wadhurst and in the industrial schools, etc., have gone to the colonies because in England they can hope to secure at the best only a scanty livelihood. In the author's opinion the whole problem is at present one mainly for private initiative, and the remedies must clearly be sought in the field of social organization. Measures for the improvement of this unsatisfactory state of things are discussed.

Vocational education (*Cal. Bd. Ed. Bul. 23 (1917), pp. 29*).—This bulletin contains the general regulations adopted by the California State Board of Education, July 19, 1917, for the establishment and maintenance of Federal and State aided vocational education in California. It deals with Federal and State aid available for, and the provisions and requirements of the Federal and State acts relating to, part-time vocational courses in agriculture; vocational courses, and classes in the trades, household economics, and industries; and continuation classes in civic and vocational subjects.

For the vocational courses in agriculture a one-year course of not less than 36 weeks is recommended at the present time, but a second year may be added later if a sufficient number of pupils desire the work. Not less than three hours a day of each pupil's time must be devoted to farm-project work and to the instruction pertaining thereto, and to farm mechanics. Each pupil must also conduct at least one farm project during the school year, such as the producing and marketing of farm, orchard, vineyard, or garden crops, or of bees, poultry, stock, or other farm animals or their products, and upon a commercially productive basis.

Schools maintaining vocational agricultural courses under these acts must also provide for the organization and supervision of agricultural clubs, under the agricultural extension department of the University of California, for pupils not maintaining project work as a part of such courses.

The regulations also deal with the sources of financial support, qualifications of teachers, etc.

Report of agriculture in the high schools of Michigan (*Mich. Agr. Col., Dept. Agr. Ed. Bul.* 18 (1917), pp. 21, App. 11).—This bulletin gives a brief account of the actual methods of instruction and the results obtained during the past year.

The instruction comprises prevocational agriculture and garden practice in the seventh and eighth grades, plant and animal industry in the ninth and tenth grades, and special agricultural subjects, such as crops, soils, horticulture, and farm engineering in the eleventh and twelfth grades. In 1916-17, 57 high schools employed college-trained instructors and 8 employed instructors with less than college training; 25 high schools had developed 4-unit courses, 24 offered 4 units by alternating the last two years, and 8 schools had 2-year courses. The total number of students enrolled in agricultural subjects was 2,414, of whom 644 conducted farm-project work and 1,298 garden-project work. Twenty instructors were employed for 12 months in the year and 26 gave prevocational instruction in grades 7 and 8. Seventeen schools had land which was used for demonstrations and projects. A list of the schools and teachers giving instruction in agriculture in 1917-18 is included.

Report of a visit to the agricultural schools, J. MALMBROS (*Am. Agron. [Santiago de Chile]*, 8 (1914), No. 4, pp. 5-23).—This is a report on the work of the four schools of agriculture in Chile, located respectively at Concepcion, Chillan, Cauquenes, and Talca, under the control of the General Inspection of Agriculture.

List of agricultural and horticultural officials, institutions, and organizations (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag. en Meded. Dir. Landb.*, No. 2 (1917), pp. 139).—This is the official organization list of the direction of agriculture of the department of agriculture, industry, and commerce, including higher and secondary agricultural education and research institutions, agricultural and horticultural winter schools and courses, itinerant instructors, and associations in the Netherlands in 1917.

Preparation of teachers for nature study and elementary agriculture by the normal schools, E. R. DOWNING (*School Sci. and Math.*, 17 (1917), No. 7, pp. 609-621).—Data are given in tabular form on the nature study and agriculture courses, and incidentally courses in botany and zoology, offered to normal school students, and the nature study or elementary science work given in the practice schools. The information was obtained through questionnaires sent to the normal schools in this country.

Plant ecology and its relation to agriculture, W. G. WATERMAN (*Science*, n. ser., 46 (1917), No. 1184, pp. 223-228).—In this paper delivered before the Illinois Academy of Science, February 23, 1917, the author discusses the content of ecology and its relation to agriculture.

He finds that "up to the present the method in agricultural texts and courses has been to teach a little plant morphology, a chapter on plant activities, and then nine-tenths of the work on agricultural practice." He would recommend in addition the insertion of a section on ecological principles covering the content of ecology as outlined. It should be general and theoretical and yet so related to agricultural practice as to form a suitable foundation for the agricultural course.

Report of committee on education: Amount of agricultural engineering work offered in agricultural colleges, A. H. GILBERT (*Trans. Amer. Soc. Agr. Engin.*, 10 (1916), No. 1, pp. 101-104).—This is in continuation of a report made at the meeting of the preceding year (*E. S. R.*, 34, p. 498) on an investigation of the amount of agricultural engineering work offered in the State agricultural colleges in the United States and Canada.

The luncheon as a project in elementary and secondary education, JAMES H. SNOW (*Jour. Home Econ.*, 9 (1917), No. 3, pp. 361-364).—This is a discussion, from the standpoint of the large city, of some of the things that are being done and planned along this line in Chicago. Both class and individual projects are found possible, those being practical applications of lessons learned. Work which is not educationally valuable becomes paid service.

Soils and fertilizers, T. L. LYON, edited by L. H. BAILEY (*New York: The Macmillan Co.*, 1917, pp. XX+255, pls. 16, figs. 34).—This text on soils for secondary schools, short courses in agriculture, and summer courses for teachers, deals with soils as a medium for plant growth; soil formation and transportation; texture and structure of soils; organic matter; soil water; plant food; materials in soils; acid and alkali soils; the germ life of the soil; soil air and soil temperature; nitrogenous, phosphoric acid, potash, and sulphur fertilizers; lime; the purchase, mixing, and use of fertilizers; farm and green manures; and crop rotation. Questions and field and laboratory exercises accompany each chapter. No chemical symbols or formulas have been used.

Our bird book, A. C. WEBB (*Kansas City, Mo.: Pioneer Publishing Co.*, 1917, pp. XII+244, pl. 1, figs. 28).—This nature reader, prepared for use in schools, presents a simple and definite educational plan for the study of common birds. In connection with the lesson on each bird, there is a blank page for a record of the pupil's personal observations. On a long sheet inserted in the book are the pictures of 14 birds in their natural colors, which are to be mounted on specially prepared pages scattered throughout the book in connection with the stories describing the birds.

Field lore for young farmers, KATHERINE A. GRIMES, edited by W. L. HUTCHINSON (*Dallas, Tex.: The Southern Publishing Co.*, 1917, pp. X+194, figs. 86).—This text on nature, intended for the graded schools, is devoted to a study of such topics as nature's elements and compounds, the soil, plant food, inside and outside growers, the right plant in the right place, rotation of crops, handling difficult soils, planting, taking care of the crop, cotton, beneficial and injurious weeds, birds, and insects, plant diseases, how to get good seed, the life work of the plant, how seeds travel, the farm wood lot, the home garden, making home attractive, and chickens.

Outlines of agricultural economics, E. G. NOURSE (*Chicago: Univ. Chicago Press*, 1917, pp. IX+95, figs. 3).—This is a class book of questions and problems to accompany the author's text on agricultural economics, already noted (E. S. R., 36, p. 390).

Home demonstration work as correlated with the Louisiana public schools, ALICE S. HICKMAN ET AL. (*La. Agr. Col. Ext. Div. Bul.* 24 (1917), pp. 170, figs. 33).—The home demonstration work outlined in this bulletin comprises four projects, gardening, canning, cooking, and sewing, each extending over four years and with the first year in the elementary or grammar schools. A credit of one unit for high school graduation is given on completion of the four years' work.

Report of the women's institutes of the Province of Ontario, 1916 (*Ept. Women's Insts. Ontario*, 1916, pt. 1, pp. 120, figs. 2).—This is the annual report on the progress of women's institute work in Ontario for 1916. It consists of the proceedings of the annual conventions of 1915, together with statistical data for 1915-16. The demonstration lecture work included 75 courses in food and cooking, sewing, and home nursing and first aid, attended by about 2,700 women and girls. The 1916 home garden and canning contest was participated in by 22 branch institutions representing a total of 245 gardens.

MISCELLANEOUS.

Annual Report of California Station, 1917 (*California Sta. Rpt. 1917*, pp. 95, pls. 2, fig. 1).—This contains the organization list and a report of the director on the work and publications during the year, including a list of the station projects, some data pertaining to the instruction and extension work of the college of agriculture, a reprint of the publication previously noted (E. S. R., 37, p. 607), and a summary of the reports of the field parties conducting this inquiry.

Report of progress of work and guide to experimental plats, North Central Experiment Station, Grand Rapids, 1916 (*Minnesota Sta., Rpt. Grand Rapids Substa., 1916*, pp. 64, figs. 50).—This is a report of the work of the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report of Ohio Station, 1917 (*Ohio Sta. Bul. 315* (1917), pp. XXXV+5, fig. 1).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1917, and a report of the director summarizing the work and publications of the station during the year.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 2* (1917), No. 2, pp. 232-315, figs. 15).—This contains several articles abstracted elsewhere in this issue, together with the following: Entomological Survey of Ohio Wheat Fields, by H. A. Gossard; Shade Trees Eaten by Walnut Datana; The Green Soldier Bug, by R. D. Whitmarsh, an abstract of Bulletin 310 (E. S. R., 37, p. 253); Soy Beans As Human Food, by J. B. Park, an extract from Bulletin 312 (E. S. R., 37, p. 235); Hill Selection Increases Potato Yield; and notes.

NOTES.

Purdue University and Station.—A number of special courses have been established to give extra training for men preparing for military service. One of these courses deals with the handling of horses and the treatment of their more common diseases, several with gas engines, and another with military French.

A course of instruction for city garden supervisors was given in March.

The station is cooperating with the Office of Cereal Investigations of the U. S. Department of Agriculture in a study of root and systemic diseases of corn. The work is to be in direct charge of George N. Hoffer of the Bureau of Plant Industry. An elaborate equipment for these physiological and pathological investigations has been installed in the station laboratories.

Frank I. Odell has been appointed manager of the Moses Fell Annex to the station, located at Bedford. Claude Harper of the Illinois University and Station has been appointed assistant in animal husbandry for extension work with sheep.

Iowa College and Station.—Recent lines of investigation to be undertaken include studies of soft corn silage and digestion trials with lean and fat cows on maintenance, by the animal husbandry section, buying in spring v. wintering bees and a comparison of Italian, Carniolan, and Caucasian bees, by the entomology section, calcium balance of dairy cows, by the chemistry section, and ventilating systems for barns, by the agricultural engineering section.

M. F. P. Costelloe, head of the department of agricultural engineering since 1915, died January 12 at the age of 37 years. Prof. Costelloe was a 1906 graduate in civil engineering of the University of Nebraska and received the degree of agricultural engineer in 1916. He had had considerable experience on various engineering projects, giving special attention to irrigation, sewage disposal, and drainage.

Knute Espe and T. H. Benton, assistants in the soil survey, and G. W. Roark, assistant in chemistry, have resigned, and W. E. Whitehouse, assistant in pomology, has been given leave of absence for the period of the war. Assistants have been appointed as follows: Pomology, H. E. Nichols; soil survey, E. I. Angell; and entomology, Albert Hartzell.

Nebraska University and Station.—J. R. Cooper has resigned as associate professor of horticulture and assistant horticulturist to become professor of horticulture in the University of Arkansas, effective April 1.

Pennsylvania Station.—J. S. Owens, assistant in experimental agronomy, resigned January 16.

Virginia Station.—T. J. Murray, associate professor of plant pathology and bacteriology and associate bacteriologist, resigned February 5 to accept a similar position at the Washington College and Station.

Virginia Truck Station.—The substation established at Tasley in cooperation with the State board of agriculture five years ago has been relocated with a better farm and buildings near Onley.

Selective Service Law and Agricultural Students.—An amendment to the U. S. Selective Service Regulations is announced by the Provost Marshal General regarding certain land-grant college students in agriculture. The text of the amendment is as follows: "Under such regulations as the Quartermaster

General may prescribe, students pursuing a course of agriculture, in the senior year, in land-grant agricultural colleges, whose class standing places them in the upper third of the senior class as determined by the school authorities, may enlist in the Enlisted Reserve Corps of the Quartermaster's Department, and thereafter, upon presentation by the registrant to his local board of a certificate of such enlistment, such certificate shall be filed with the questionnaire and the registrant shall be placed in Class 5 on the ground that he is in the military service of "the United States."

Progress in Agricultural Instruction in Latin America.—A recent executive decree in Colombia provides for the establishment of a tropical agricultural station annexed to the national institute of agronomy in the municipality of San Lorenzo, Department of Tolima. General instruction is expected to be given in various branches of agriculture and allied sciences, including veterinary science, and courses will also be arranged for students who desire to specialize along certain lines. Particular attention will be paid to teaching students how to distinguish beneficial from injurious insects met with in practical agriculture. The government of the department of Antioquia has taken preliminary steps to establish a laboratory for the manufacture of vaccine to be used by stockmen in the prevention of murrain and similar diseases of cattle. A recent executive decree places the national meteorological service, established in 1917, under the department of public instruction.

The school of agricultural mechanics at Bahía Blanca, Argentina, which admits pupils of not less than 17 years of age, had an attendance of 32 in 1918. The shops of the school have been equipped with new machinery.

A Brazilian forestry service has been authorized, to be under the direction of the department of agriculture and to have for its object the conservation and improvement of forests and the regulation of all matters pertaining to them.

The department of agriculture of the Dominican Republic has provided a traveling agricultural instructor to recommend measures for obtaining more abundant yields of staple crops. An agricultural school under the direction of Dr. Emil Jeannot was recently organized at Charpentier, Haiti.

An agricultural experiment station of the coeducational schools of Amatitlan, Guatemala, recently began operations, the equipment having been donated by a philanthropic citizen of the community.

In Mexico a school of agriculture was opened in Hermosillo, the capital of the State of Sonora, in March, 1917, under the direction of the governor of that commonwealth. In the same month a national forestry school was inaugurated at Coyoacán, a suburb of the City of Mexico. The agricultural experiment stations in the States of Vera Cruz, Puebla, San Luis Potosí, Oaxaca, and Tabasco, have been supplied with modern machinery and appliances, as well as improved seeds, and instruction by experts will be given to farmers in these states. A publication entitled *Revista agrícola* has been founded in the national capital.

An agricultural school has been established in the Department of Leon, Nicaragua, with Manuel Godoy as president. The government has also formulated a plan for a course of instruction in the new national school of agriculture, according to which there will be a section for the instruction of laborers or farm hands, a section for agriculturalists or farmers, and a section for agronomists or agricultural engineers. The governor of each province is to select by competitive contests two boys, who have passed the fourth grade of primary instruction and are over 13 years of age, for entrance into this school at the expense of the State. A school for boys not over 16 years of age, who have studied agronomy for at least a year, was opened recently at Chinandega City, with an appropriation of \$5,000 for its installation. It is equipped with up-to-date machinery and implements necessary for the proper cultivation of cereals

and other crops, and makes a specialty of teaching its pupils the practical use and advantages of machinery in agricultural operations.

The agricultural bank in Paraguay has established weather bureaus in the principal farming centers and proposes to compile statistics based on data obtained from these stations. The government of Uruguay has granted 10 scholarships in its agricultural school to young Paraguayans who desire to continue their studies in Uruguay.

A law recently enacted by the Peruvian Congress establishes an industrial school in the city of Iquitos. This school has an agricultural department and a department of arts and crafts, and is to be maintained from the proceeds of a tax on rubber shipped through the port of Iquitos and on the registered tonnage of vessels clearing from this port with cargoes for delivery to the port of Loreto. The course offered by each department is to extend over three years. The agricultural department is intended to fit students for trained work in the vast agricultural region of Peru, east of the Andes Mountains, much of which is as yet unexplored except in the immediate vicinity of navigable streams, and nearly all of which is virgin territory for the development of agriculture. The site of the agricultural department will be the Caucho Experimental Station in Iquitos. An executive decree of April 10, 1917, also provided for the reorganization of the national school of agriculture and veterinary science and the enlargement of its functions.

A recent executive decree in Salvador provides rules and regulations for the operation of the pathological-vegetable laboratory established under the governmental order of September 19, 1914, for the study of the diseases of plants and proper methods and remedies for preventing and combating them.

An executive decree in Uruguay places its agronomic stations under the immediate supervision and control of the Department of Fomento. At the suggestion of the park commission of Montevideo, a school for gardeners has been established in the national capital for the purpose of supplying special skilled labor of this kind.

The Uruguay national nursery at Toledo is furnishing a large number of trees for planting operations. A recent decree prescribes that persons owning not less than 100 hectares of land shall be supplied gratis with 100 trees, and it is estimated that 100,000 trees will be distributed annually in this way. The nursery referred to will also donate to rural communities, schools, police farms, etc., 100,000 trees during the present year and 200,000 trees yearly thereafter. For the purpose of increasing the cultivation of flax, which has considerably decreased during the last few years, the president of the Republic has issued a decree requiring expert agronomists at the Estanzuela nursery, as well as those at the agricultural stations at Salto, Paysandu, and Cerro Largo, to investigate and report on the different kinds of flax grown in these regions.

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